Vol. XXX DECEMBER 1936 Number 12

EXCAVATING ENGINEER

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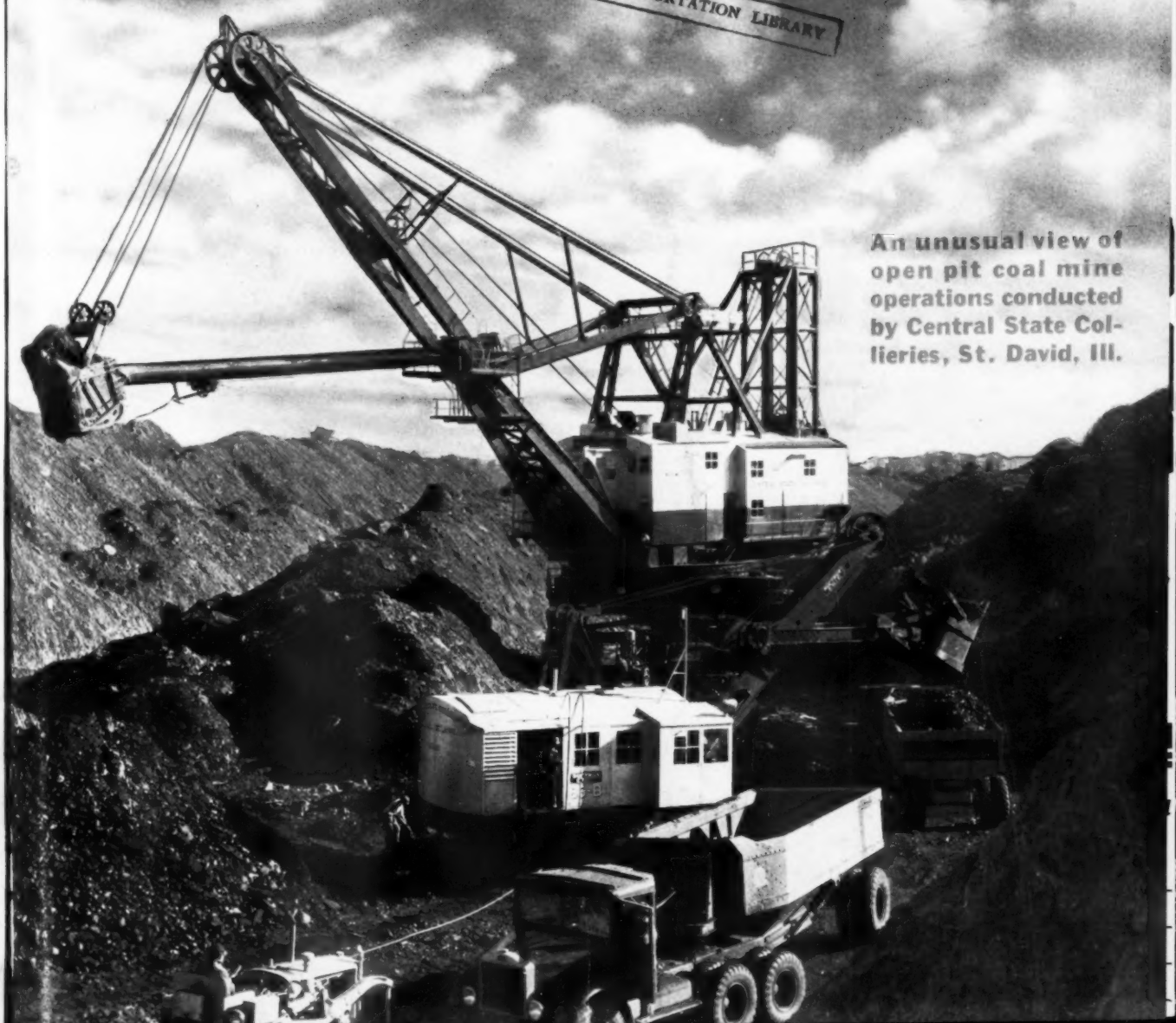

An unusual view of open pit coal mine operations conducted by Central State Collieries, St. David, Ill.

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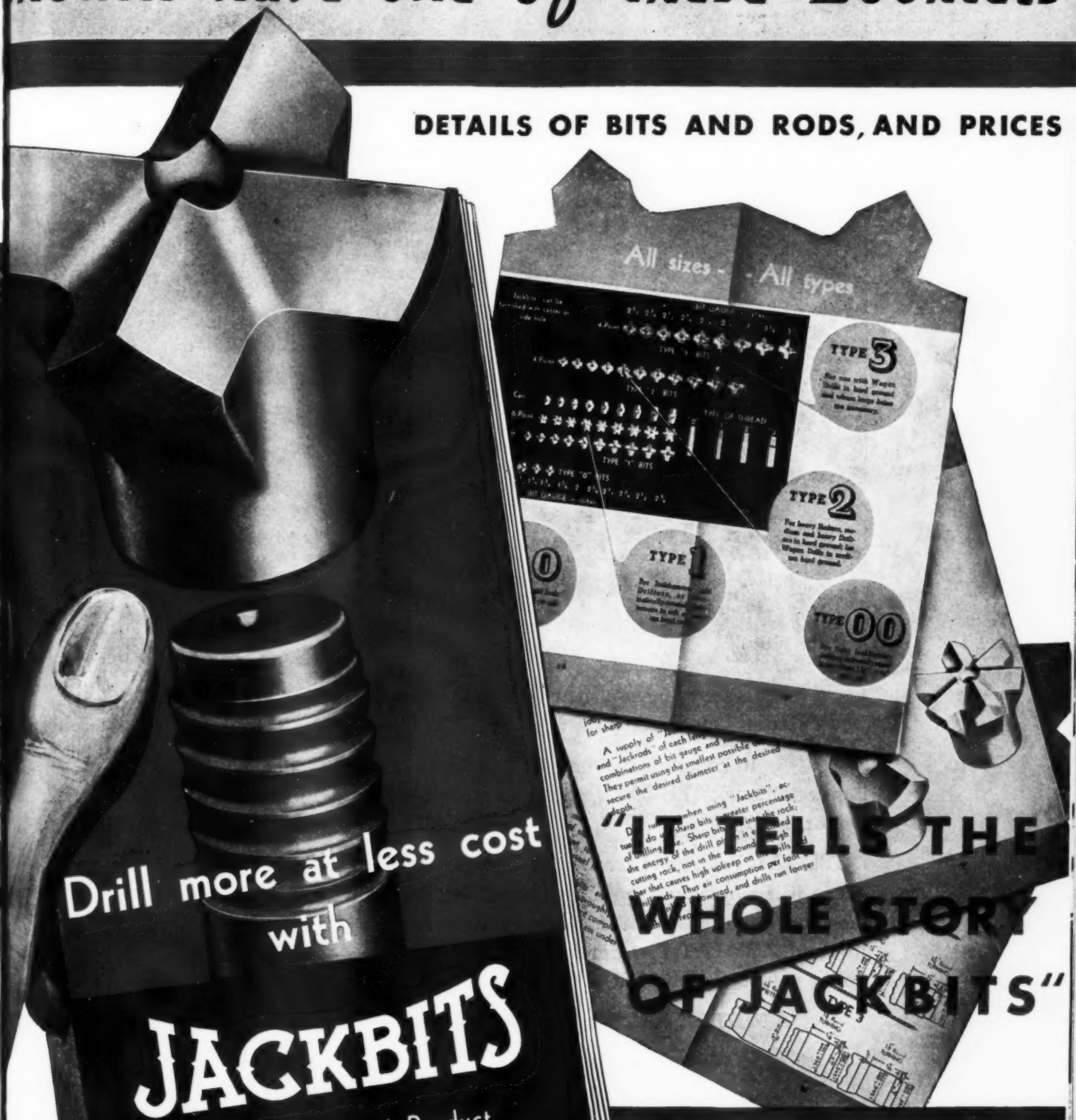

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EXCAVATING ENGINEER

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DEVOTED EXCLUSIVELY TO EXCAVATION

About Excavating Projects — By Excavating Men — For Excavating Men — The World Over

Vol. 30 DECEMBER, 1936 No. 12

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It's not often that stripping and loading shovels, hauling equipment and clean-up tractor and bullgrader can all be shown in one picture as they are here.

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West Slope Construction Company are putting over 525,000 yards per month into this 10,000,000 yard rock fill dam.

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Looking Ahead

These interesting articles will appear in early issues of Excavating Engineer. Watch for them!

Highway Forecast

Our next issue will feature the 1937 highway program for the 48 states and the federal government, as our January issues have done in past years. In addition to the special forecast, regular departments will be devoted to new developments in highway work.

We've Tried Everything

If you think William Williams solved all his difficulties in the last issue, wait until you read about his experiences in producing a movie epic!

Spillway at Fort Peck

The fourth article in our series of operating stories of this great earth fill dam. Disintegrating shale and cold winter weather are the hurdles successfully mounted in handling this 14,000,000-yard job.

Published Monthly by **THE EXCAVATING ENGINEER PUBLISHING COMPANY, South Milwaukee, Wisconsin, U.S.A.**

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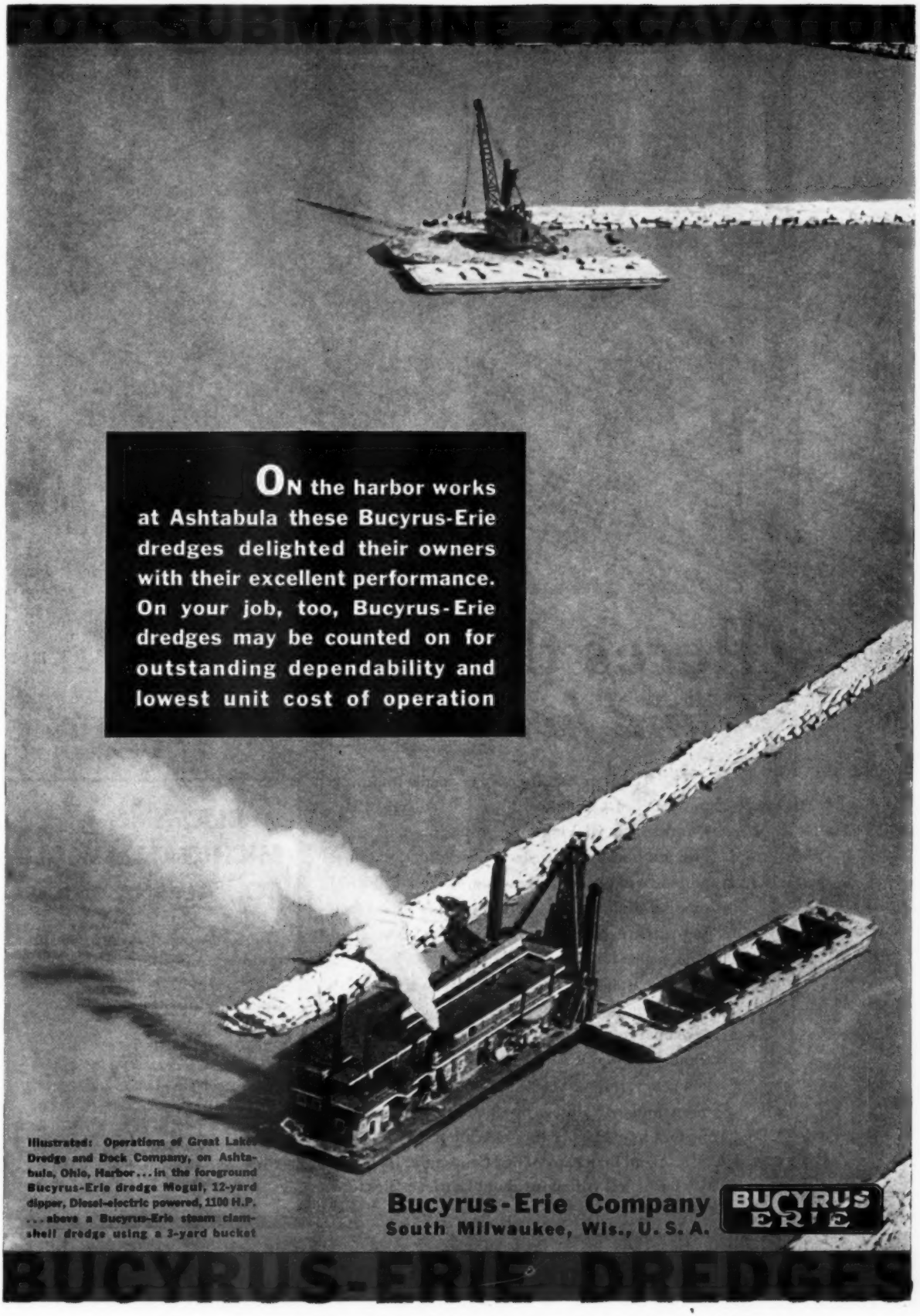
ON the harbor works at Ashtabula these Bucyrus-Erie dredges delighted their owners with their excellent performance. On your job, too, Bucyrus-Erie dredges may be counted on for outstanding dependability and lowest unit cost of operation
Illustrated: Operations of Great Lakes Dredge and Dock Company, on Ashtabula, Ohio, Harbor... in the foreground Bucyrus-Erie dredge Mogul, 12-yard dipper, Diesel-electric powered, 1100 H.P. ...above a Bucyrus-Erie steam clam-shell dredge using a 3-yard bucket
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Number of holes	34
Average depth of holes	48 ft.
Distance back from face	18 ft.
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Cordeau fuse used	1,675 ft.
Tons of rock displaced (Limestone)	31,600

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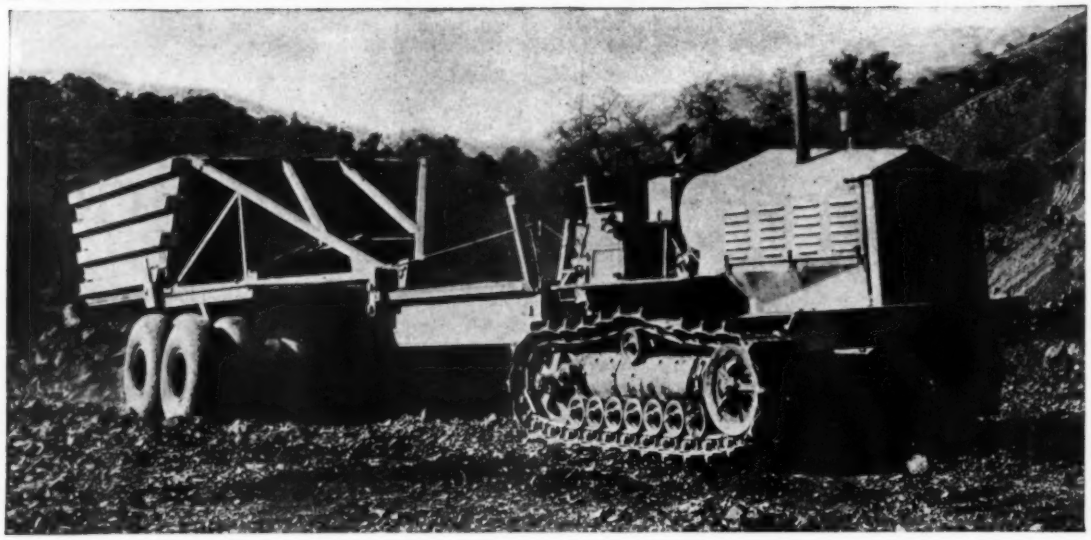
KEEPING UP TO SCHEDULE on TIMKEN BEARINGS



Timken-equipped Cletrac "80" hauling a LeTourneau 25-yard buggy also equipped with Timken Bearings.

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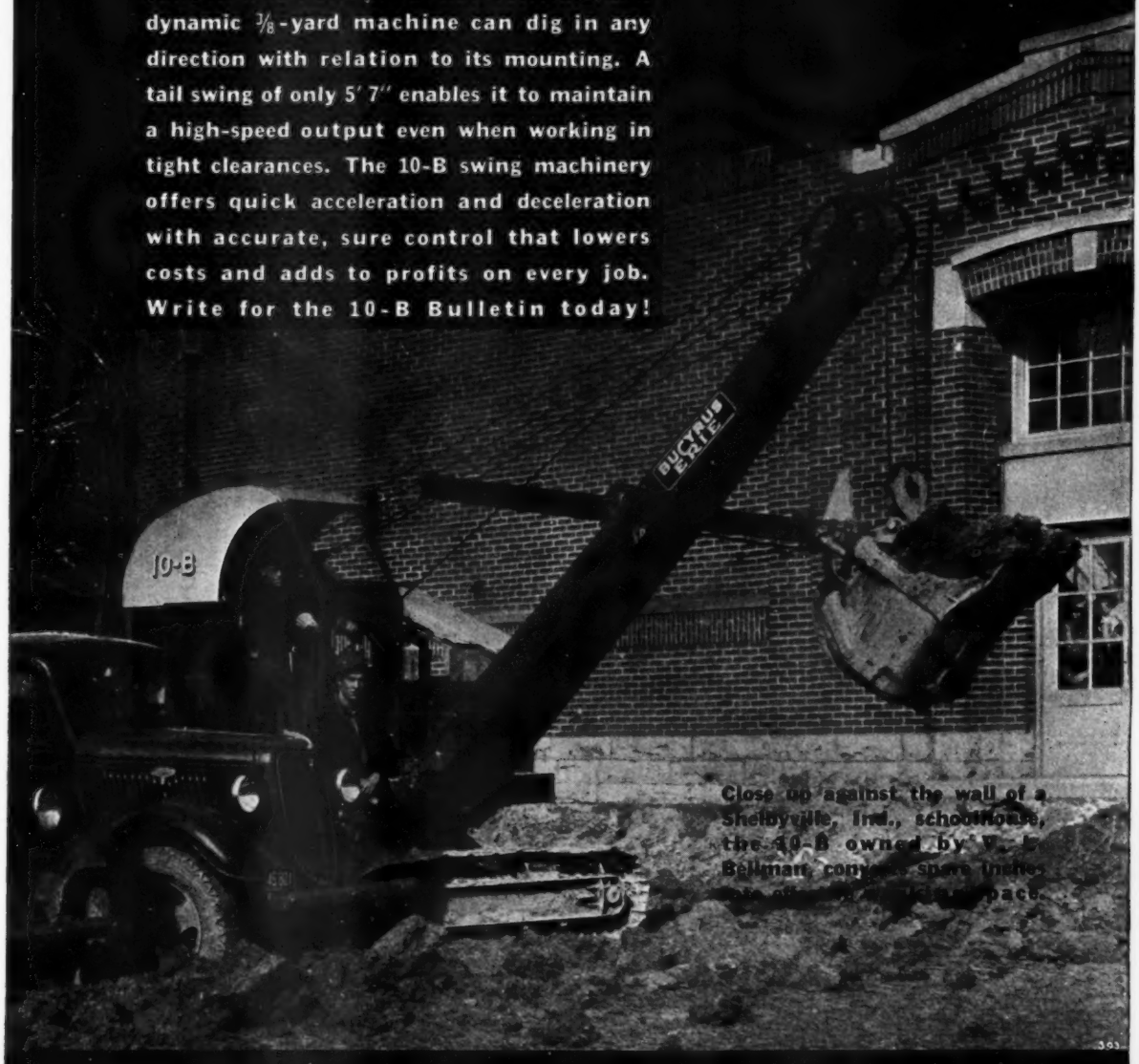

Close up against the wall of a Shelbyville, Ind., schoolhouse, the 10-B owned by V. E. Bellmann conserves space.

BUCYRUS ERIE

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EXCAVATING

ENGINEER

VOL. XXX DECEMBER, 1936 Number 12

Building San Gabriel Dam No. 1

West Slope Construction Company Handles Interesting Excavating Problems in Constructing World's Largest Rock-Fill Flood Control Dam.

By **MEL WHARTON**

IN THE deeply ravined San Gabriel canyon, thirty miles east by north from the city of Los Angeles, work is in progress on the world's largest rock fill flood control dam, necessitating the blasting, quarrying, removing and placing of about 10,640,000 cu. yds. of fill material.

Disastrous floods of the past have caused a property damage of approximately $150,000,000 in the lush valleys below the dam site, it is estimated, and the completion of the dam is expected to remove for once and all similar dangers which have not infrequently isolated portions of Los Angeles County and taken toll of scores of human lives.

The West Slope Construction Company is building the vast rock-fill structure for the Los Angeles County Flood Control District at a cost estimated at about $12,000,000. A concrete dam was formerly started in the canyon near the site of No. 1 but was abandoned when construction indicated the nature of rock in the vicinity would not tolerate a dam of the magnificent proportions scheduled. San Gabriel Dam No. 1 is expected to fulfill all expectations at about one-half the estimated cost of a masonry structure.

Design

Dam No. 1 consists of a rock fill having a base about 1,950 feet from upstream to downstream toes. The above-bedrock height averages 375 feet. The bank to bank width is variable in accordance with the contours of the canyon walls. The crest line of the dam is 1,540 feet, which is near, however, the maximum width of the structure. The design provides for a theoretical slope, benched, of 3 to 1, and engineers have taken into consideration the possibility of earthquakes in their figures. The dam is divided into 6 zones, each demanding a specific quality and size of rock fill. During construction, flow water through the canyon is carried through a diversion tunnel, concrete lined, 30 feet in diameter and 1,850 feet long, having a capacity of 35,000 sec. feet—sufficient to take care of the heaviest floods that may be anticipated.

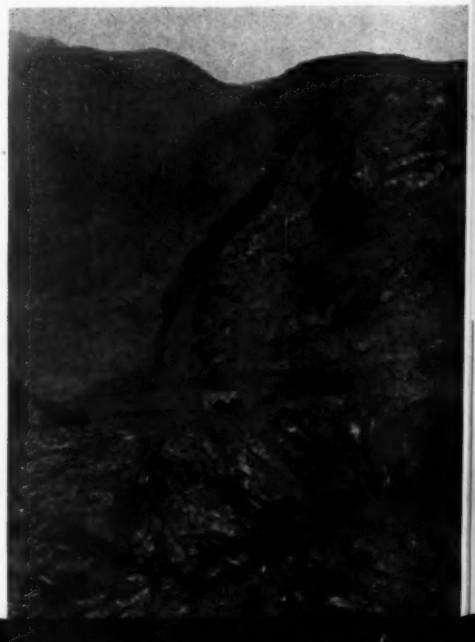
Outlet works consist of a large trash rack at the entrance to the diversion tunnel, a concrete plug about 350 feet downstream from the tunnel portal, a butterfly valve control installed in the plug for two penstocks 11 feet in diameter, one 8 feet diameter, and one 4 feet diameter controlled by needle valves at the downstream end. Discharge capacity of the penstock with water at the spillway is 15,000 sec. feet. The spillway, on the west side of the canyon, will cut through rock, and is designed to handle 80,000 sec. feet with a residual freeboard of 15 feet. This is equivalent to an ultimate of 250,000 sec. feet before overflowing the dam. The storage capacity of the dam at spillway level is 56,000 acre feet; at crest, 72,000 acre feet.

700-Foot Rock Quarry

All of the fill material with the exception of approximately 1,000,000 cu. yds. of special sand-clay material that is obtained a mile and a half upstream from the dam site, is quarried from a mighty ridge of rock 700 feet high, and pyramidal in face contour lying adjacent to the lower toe of the dam on the east bank of the San Gabriel canyon. The quarry is only half a mile from the dam, and the transportation is mostly on the downhill.

The construction of San Gabriel Dam No. 1 has necessitated some unusual feats in handling and placement of materials. Special Mack trucks, of 25 cubic yard capacity, thought to be the largest ever built for construction work, are employed as part of the transport fleet. These giants of truckdom pick up quarried material from Bucyrus-Erie electric

• *The gouge shown running down the quarry may look like a landslide, but it really is the chute blasted out to drop rock to grizzly and loading hoppers.*



• *The picture on the opposite page was taken looking down the chute used to drop rock about 200 feet from upper quarry level to loading hoppers. Also in the picture are concrete outlet for diversion tunnel, and West Slope machine shops.*

shovels and from grizzlies and haul it to the proper zone in the canyon bed and dump it.

Good Breakage From Primary Blasting

No little part of the remarkable speed with which No. 1 is progressing is attributed to the efficient operation of the shovels. Most of the quarrying is power shovel work after explosives have broken and loosened the material. The quarry is "shot" down in series of steps, largely with the use of Atlas black powder and dynamite. There is no such thing as a typical shot, on account of the wide variation of the size of the benches. In general, however, the benches are drilled to a depth of 50 feet, shot and loaded onto trucks. The 700-foot-high face of the quarry will be carried back 700 feet into the mountainside by the time the fill is completed, engineers estimate. The quarry is 1000 feet long on its base. Very little secondary blasting has so far been required, the stone breaking into sizes requisite for the dam.

Eight-inch hole is put down with six Bucyrus-Armstrong 29-T blast-hole rigs. The weight of each string of tools is about 2,800 pounds.

Nearly all of the material which does not require screening is loaded directly by Bucyrus-Erie 120-B electric shovels into 20 and 25 cubic yard capacity dump trucks. The 120-Bs are full revolving, caterpillar mounted, and equipped with 4¾-yard buckets. The extreme mobility of these shovels enables them to load the motor fleet in a minimum of time. Besides the two electric shovels mentioned, there are three Bucyrus-Erie 52-B, 2½-yard machines, Diesel powered, one 37-B, 1½-yard gasoline shovel, and one P&H 3½-yard Diesel—all working where a wired source of power is difficult to obtain. Except for these machines, operations at San Gabriel No. 1 are quite fully electrified.

One of the features of this project is the system used in getting material from the quarry face to dam. A chute, or open glory hole, has been blasted in the face. Trucks loaded by the 120-Bs at the top level of operations, dump rock into the top of this chute. Gravity then carries it down to a grizzly consisting of moving bars spaced 6 inches apart, with transverse fins providing the 9-inch second dimension required to provide the specified 6x9-inch separation. Material passing through this grizzly is carried by belt conveyor to two 500-yard-capacity, steel loading bins. From these, trucks carry rock to the dam.

Oversize at the grizzly is loaded directly into trucks which are protected from falling rock by a short concrete tunnel through which they operate. Capacity of the grizzly is about 8,000 cubic yards per shift.

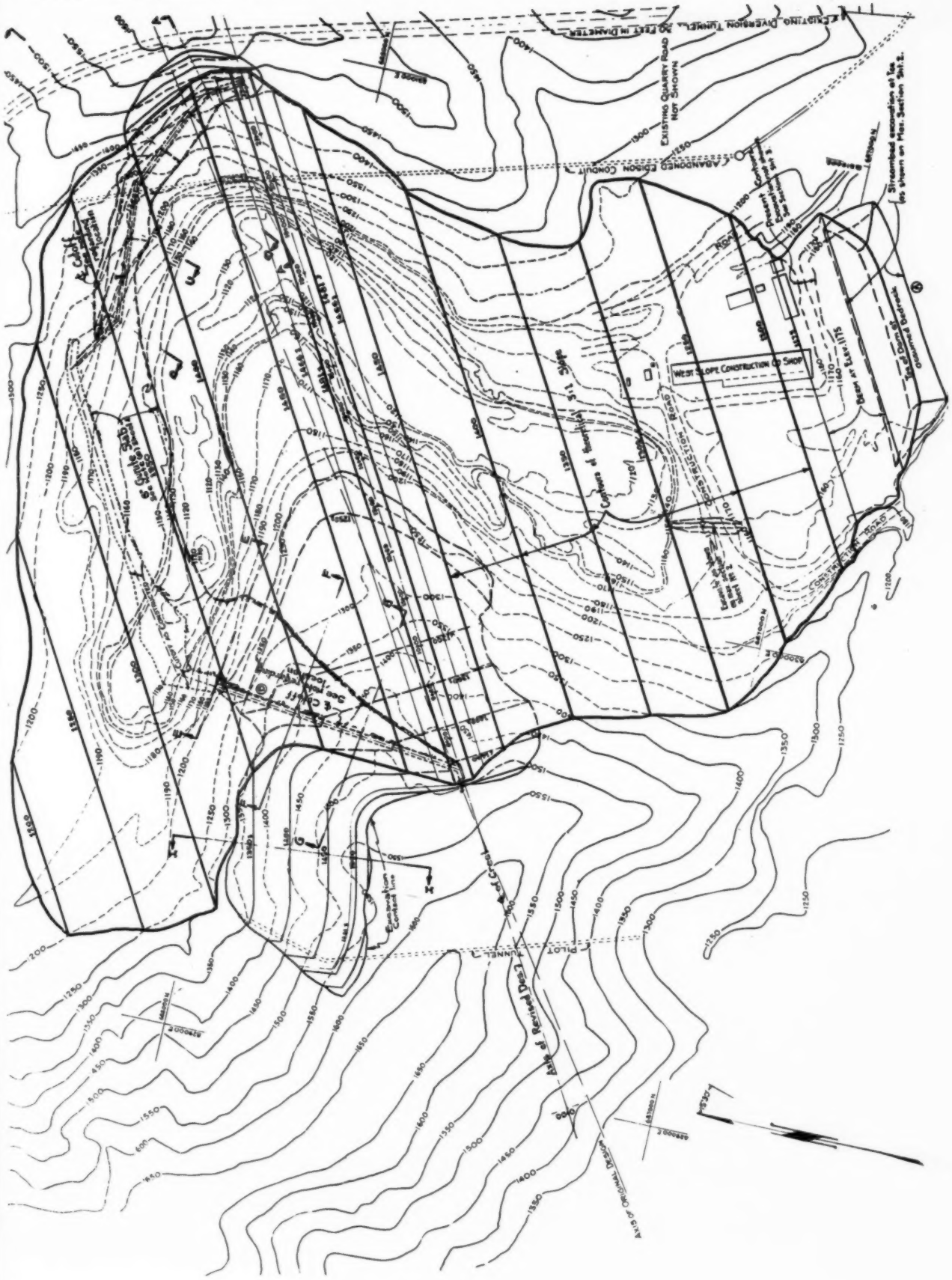
This unique and ingenious system was worked out by Mr. Daly of the West Slope Construction Company, and takes full advantage of the natural physical characteristics of the quarry-dam setup.

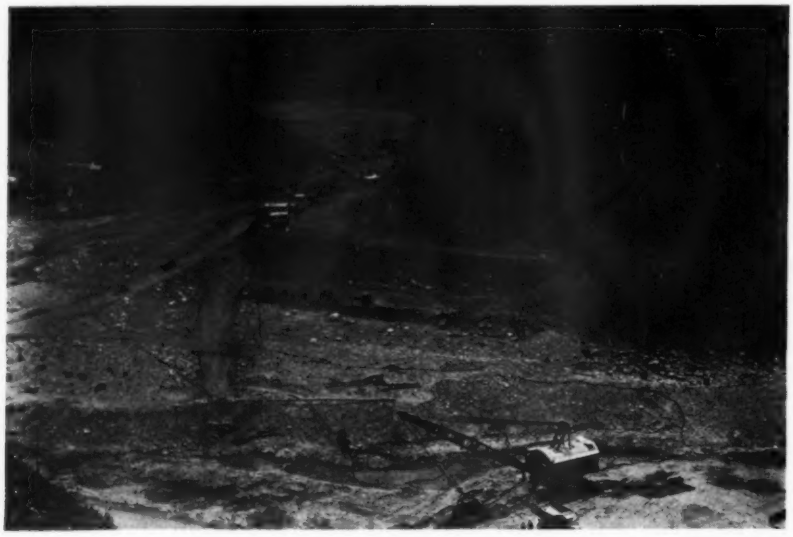
Special Trucks Handle Tough Hauling

The rock truck fleet consists of 30 motors. Twenty of these are the monster 25-cubic yard jobs, the remaining ten having a ca-

• *On the opposite page is a contour map showing revised design for San Gabriel Dam No. 1.*

• *Fill at San Gabriel is building up steadily in the "steps" shown here. With the rock chute in operation, material is going into the dam at full speed.*


EXISTING DIVERSION TUNNEL, 30 FEET IN DIAMETER
ABANDONED EDISON CONDUIT
EXISTING QUARRY ROAD NOT SHOWN
WEST SLOPE CONSTRUCTION CO. SHOP
Streambed excavation at Tee (as shown on Misc. Section Sht. 2.
Axis of Revised Dam
PILOT TUNNEL
Axis of Original Dam



• This view of operations at the base of the dam shows the appearance of the site before the rock fill began to be piled in. The precipitous rock walls indicate the excellence of the location for such a dam.

pacity each of 20 cubic yards. These 20-yard trucks are being changed over to 25, rear ends being changed from four-wheel solid tires to 8-wheel pneumatics. The bodies are of $\frac{3}{16}$-inch steel with reinforcing lining strips on the floors. These strips are removed and replaced when they begin to show excessive wear. The 25-yard trucks have double axles and are equipped on all ten wheels with pneumatic tires, size 13.50 by 24, with tractor-type treads. The 20-yard trucks were equipped with solid tires.

The monstrous loads which the 20-yard trucks carry tended, engineers of the West Coast Construction Company found, to lift the cab end off the ground while dumping. Consequently company engineers designed a dumping mechanism consisting of two steel rollers attached to the rear under portion of the truck bodies by means of a hydraulic jack, which eliminated this trouble. The device is semi-retractable and sufficiently out of the way when the truck is traveling not to create any road hazard. When unloading, the dual steel wheels are placed upon the ground and the load gradually dumped by lowering the hydraulic hoist. A semi-rigid steel tube coupled to the device from an under truss of the truck allows the apparatus to be moved with the truck. This device is no longer necessary as all trucks are being changed to 25-yard capacity and pneumatic tires. Fourteen 7-yard dump body Mack trucks are used for hauling the sandy clay material used in the impervious Zone 2.

Novel Compacting Method

Extraordinary methods are employed to compact the fill. Among the chief measures are rolling, tamping and sluicing. For every cubic yard of material transported and placed in Zones 1, 4, 5, and 6, two cubic yards of water is poured upon it. In Zones 2 and 3 about 12 per cent of water, relative to the dry weight of fill material, is applied. Actual figures are: Zone 2—13 per cent moisture of dry weight of composite. Zone 3—10 per cent moisture of dry weight of fines (smaller than $\frac{1}{4}$ inch). On this basis a total of about 4,252,000,000 gallons of water will be played upon the dam through hydraulic nozzles and by means of motored wagon-type sprinklers before the structure is finished. The water used is pumped up to a steel reservoir tank located about 400 feet above the river bed on the east bank of the canyon. The tank has capacity for 1,350,000 gallons. The nozzles have a diameter of $1\frac{1}{2}$ inches, with nozzle pressure averaging 80 pounds per square inch. The water is pumped from a deep hole below the downstream toe of the dam by two electric 400-h.p. Byron-Jackson deepwell turbine pumps each capable of lifting 2,250 gallons a minute against a 600-foot head. The pumps are housed in a shelter built out into the supply lake. One 150-h.p. Byron-Jackson elec-

(Continued on page 664)

• Sheepshead rollers were especially designed for compacting part of the rock fill at San Gabriel. B. E. Barnhill, chief engineer for West Slope Construction Co., is shown here standing by one of them.

Mobilizing A 1½ Yard Shovel

Speedway succeeds on tough jobs by moving shovel through Chicago at need

MOVING ⅜-yard shovels in a hurry over a wide area has become fairly common. It's news, however, when a 1½-yard machine is put on the same "traveling man" schedule. That's just what Speedway Excavating & Crane Service of Chicago has done with its Bucyrus-Erie 34-B.

Speedway's main work is in wrecking concrete (see page 283, Excavating Engineer for June, 1936), but they usually have several basement excavating, grading, or filling jobs going on simultaneously in various parts of Chicago. More often than not, there are tough spots in these jobs—one reason they're being done by Speedway, which has a reputation for doing successfully what others say can't be done. To handle these tough spots, the 34-B is mounted on a 50-ton trailer and hustled through the city to the "danger zone."

Early last summer, this company finished up a big concrete removal job for Sinclair Oil Company in East Chicago (described in the above mentioned article). On completion of this work, the 34-B was moved to a basement excavation in downtown Chicago. Cleaning up work here in a hurry, the shovel was mounted on the trailer and hustled out to 31st and Halsted to take down two large concrete and steel gas tanks. Concrete and brick structures had to be removed to one foot below ground surface, and the two circular, 40-foot deep basements filled in to make the ground ready for a city park. It was necessary to pump considerable water out of these basements before filling.

• *Picture above shows clean up work on Speedway's 70,000-yard underpass job, done for the Chicago Park district at 22nd Street and the Outer Drive.*

The shovel front end equipment was changed for a 60-foot dragline boom swinging a 3-ton "skull-cracker" which was dropped on the structures. Concrete and brick walls thus broken down were bull-dozed into the 40-foot basements. As soon as the major demolition was completed, the 34-B was changed back to shovel equipment and moved off to 22nd Street and the Outer Drive.

Averaging 2,200 Yards a Day

Here, Speedway had a 60,000 or 70,000-yard job for the Chicago Park District. The work was construction of a 1,500-foot long underpass for northbound traffic through the old Century of Progress grounds. The underpass will allow pedestrians to cross to the 22nd Street beach without interrupting automobile traffic. The bridge structure is now being constructed.

The underpass had to be cut through "made" land, reclaimed from Lake Michigan by a fill of clay, sand and broken concrete. Ticklish stuff to excavate, as the

1. This 50-ton trailer, pulled by one of the 6-wheelers moves the 34-B through Chicago as needed. 2. One of Speedway's Universal cranes loading sand to be used in filling a soft spot on the underpass job. 3. After material is dumped on the soft spot, this tractor swings in and levels off the fill. 4. The ingenious greasing system devised and patented by Mr. Kolko. Note the accessibility, and also special tires which pull the big trucks through soft ground.

shovel dipper might encounter one of the concrete slabs at any time. Depth of cut ranged from 0 to 21 feet, and slopes were graded as high as 5 to 1, making the top of the cut over 200 feet wide in places.

Material to be handled was wet and soft in spots. Consequently, the shovel worked part of the time on timber mats. Despite the difficult conditions, operator Pete Hofstetter turned out an average of 2,200 yards, bank measurement, per 10-hour day with the 34-B.

This remarkable output was possible because of the 6-wheel Macks and autocars with 9-speed transmissions, used for hauling. These 12-yard trucks, with Boulder Dam type rear axles, were equipped with special Firestone "Ground-Gripper" tires, and could move over the soft surface fast enough to keep the shovel stepping without delays. This job is a good example of the dividends Speedway collects by virtue of its policy of using only the best, most modern equipment.

Ingenious Lubrication System

Another feature of the trucks is a lubrication system worked out and patented by Jack Kolko. Cups for greasing are located on the sides of the body, between the sets of rear wheels, and tubes lead the lubricant down to the desired points. This system keeps the "cups" up out of the dirt, and makes them very easy to get at.

• *J. B. Kolko, Speedway president, left; and general manager Harry de Young.*

Grading slopes and fill spots was handled by the company's two Caterpillar tractors, a "Thirty" and an R.D. 7, equipped with Athey and La-Plant-Choate bulldozers and by hand labor furnished by the Park District from W.P.A. roles. A Universal crane equipped with a ⅝-yard clamshell bucket, and mounted on a Mack truck handled distribution of some of the excavated material where the dumping and bull-dozing system could not be used.

• *The 3½-B is rooting up a big concrete pier in paving the way for a city park. Previously, Speedway took down a steel and concrete gas tank here. Note the usual appreciative audience.*

Immediately upon conclusion of this job, the 34-B was moved back to 31st Street and Halsted to root up the top of a 12- by 15-foot concrete pier which had been used to anchor one of the gas tanks—a job not usually handled by a shovel, but one which the Speedway experience and system make possible.

Behind the Speedway Method

This system, which keeps Speedway busy and successful, has been built up over a period of about 20 years. It is largely the result of the skill and planning of two men, Harry de Young, the company general manager, and Jack Kolko. Harry de Young is in charge of all outside operations. He has been with Speedway since its beginning; helping to select its name, its equipment, and its unique method. Mr. Kolko and Henry Busse, company engineer, look over a job, bid on it, and turn it over to Harry to handle. The success of the company is the best indication of how he, and the operating men working with him, have come through on the tough problems assigned to them. There are two generations of de Youngs with Speedway now, Harry's son being broken in to follow in his dad's footsteps—which speaks well for the company's future, as its success depends on the skill and experience of its personnel.

Diverting the Missouri

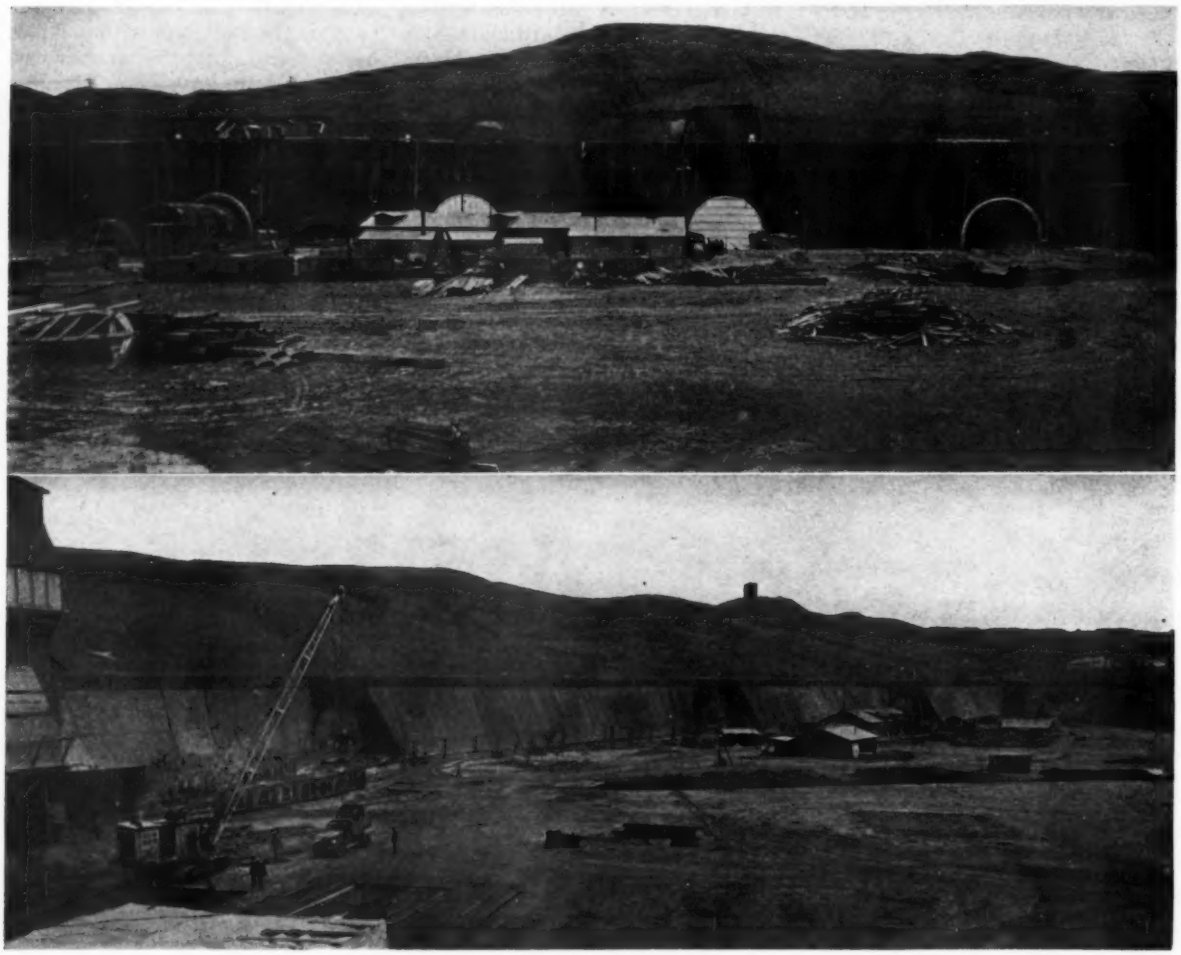
Construction of Four Tunnels Pushes Ahead to Prepare for Diversion in the Summer of 1937

ONE of the most striking things about the construction of the Great Fort Peck Project is the speed with which the work was begun and has been carried on. The job of preparing for diversion of the Missouri River is no exception—despite unusual and difficult problems which have constantly threatened progress. When you consider that work on four parallel tunnels, eight control shafts and intake and outlet structures has been carried on simultaneously, the steady progress, and lack of interference of the various parts of the job with each other, becomes highly noteworthy.

Present plans call for four tunnels, averaging 6323 feet in length, 24-feet, 8-inches in finished diameter, having steel ring beam supports and a minimum 36-inch reinforced concrete lining. In addition, No. 1 tunnel, below the control gates, will be fitted as a penstock for possible future power development with a steel pipe lining. Each tunnel will have two control shafts, main and emergency, and block concrete intake and outlet portal structures.

Originally, it was planned to construct the tunnels under two contracts. The first called for pilot tunnels, intake and outlet work, and control shafts. Tunnels were to be enlarged and braced with steel ring-beam supports and a 21-inch plain concrete lining. A second contract was then to be let, calling for a steel pipe and concrete inner lining for each of the four tunnels, which would reduce finished diameter to 26 feet. The reason for a change in plan will be discussed later in this article.

The first contract, involving total excavation of about 2,085,000 cubic yards, was let to The Mason & Walsh Company. Tunneling operations began on May 20, 1934, and by October 15, Mason & Walsh had about 1,000 men



• *Top: Recent view of intake section showing headwall and four tunnel entrances. Bottom: Work is practically complete at the outlet section. Next big activity here will be when the Missouri comes pouring from the tunnels.*

• *Left: Interior view in tunnel No. 3, showing poured invert in foreground, side-wall-and-arch form in place, and concrete pumping machine in operation. Note size of men. Below: Discharge end of concrete-pouring apparatus. "Spiders" for alignment of liner sections can be seen in background.*

at work, driving pilot tunnels from the intake section, and constructing a retaining wall at the outlet section as a protection against slides from the hills above. To get the complete picture, it will be necessary to describe various phases of the work separately, although they actually were interrelated and carried on at the same time.

Pilot Tunnels

Driving four pilot tunnels, 16 feet wide and 14 feet high at center lines was the first actual tunnel work. Jackhammers, with special 4 to 10-foot-long auger bits were used for drilling. A removable track platform was used for upper holes, and jackhammers were manually supported and guided. The holes were shot with 30 per cent gelatin, work proceeding in 3 shifts, 24 hours a day. Pilot tunnel was supported, as fast as driven, by 10 x 10 timber sets, spaced an average of about 6 feet, and a maximum of about 8 feet apart. Mucking was handled by an ingenious system, specially designed to fit the conditions of this work. "Conway" muckers loaded to a "Jeffrey" conveyor which, in turn, loaded trains of 6-yard, 36-inch gage "Austin-Western" side dump cars. Trains were pulled by 4-ton "Goodman" trolley and battery locomotives. The combination of mucker and conveyor had a carrying range of about 90 feet, which enabled 5-car trains to be loaded without switching, and helped greatly in speeding up operations. Passing sidings were provided about every 800 feet.

Trains were dumped into the hopper of a "Jeffrey" rotary crusher outside the tunnels, and material was reduced to a size which could be handled on the 30-inch conveyor leading 2,500 feet to the spoil pile. Discharge here was handled by a "Jeffrey" stacker on tracks. This system, and a similar one used in disposing of the material excavated at the outlet portal section, were designed especially for this job, and proved very efficient.

An excellent rate of progress was maintained on the pilot tunnels, average per tunnel per shift being about 12.71 feet. Record progress was 64 feet for 3 shifts in No. 3 tunnel on February 23, 1935. In one day during the preceding month, a record progress of 219 lineal feet was made (all four tunnels).

Progress achieved is particularly impressive in view of the character of the Bear Paw shale through which the tunnels were driven. This seamed formation, with its high moisture content, disintegrates very rapidly when exposed to the air. Consequently, it was not only necessary to follow the face closely with lagging and supporting timber, but it was also necessary to "paint" the

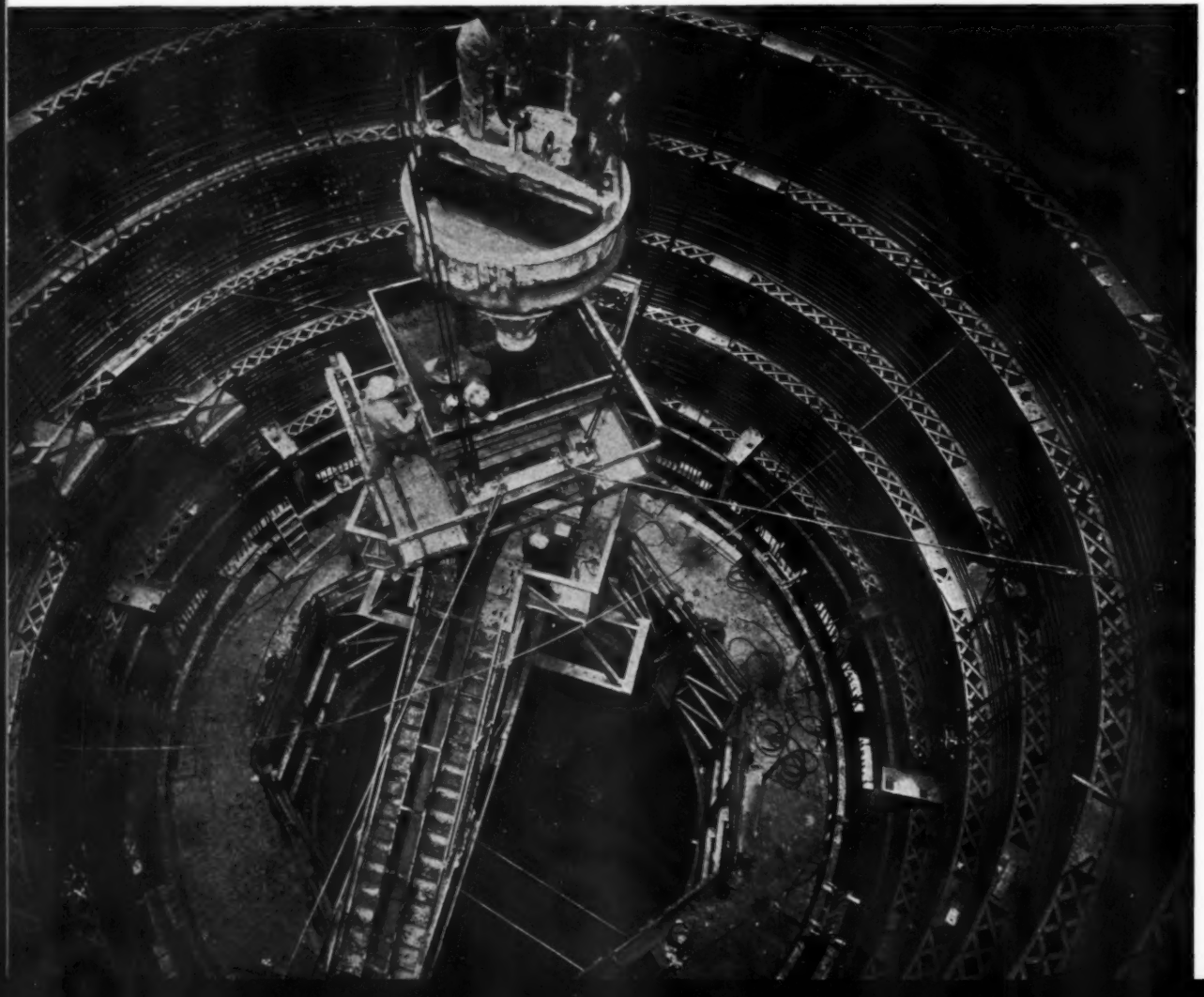
exposed surface with three coats of a special bituminous compound by the spray method in order to check weathering. Disintegration was further reduced through maintenance, winter and summer, of a relative humidity of 90 in the tunnels. Severe winter weather, which was, and is, such a handicap to outside operations at Fort Peck, was no problem in the tunnels, as the year-round temperature in them was about 54 degrees. Ventilation was provided by a "Dupont" vent tube system.

The four pilot tunnels were completed when No. 4, the longest of the four, was holed through on April 22, 1935. Enlargement then awaited completion of headwall, channel lining and open-cut portions of full-size tunnels at the outlet portals. Tests made upon holing through indicated that the Mason & Walsh forces had driven the tunnels with great accuracy, variation from alignment being only ⅜ to ½ an inch. Lines and grades were furnished by Government forces.

Open Cut Work

At the outlet section, it was necessary to construct about 880 lineal feet of main tunnels in open cuts, due to the instability of the ground in that area. In addition to the retaining wall, concrete portals for each tunnel were constructed. These are in the shape of inverted horseshoes, and require transition sections from the regular circular tunnel section. In addition, heavy headblocks, reinforced with structural steel were poured at the beginning of actual underground tunneling work. At the downstream edge of a 5-acre floor apron a concrete cut-off wall extending about 30 feet below the surface level will prevent underscour. Sections of retaining walls and open cut tunnels were poured with a "Rex" pumpcrete machine. Excavation at the outlet section amounted to about 1,510,000 yards, and was handled with shovels and clamshells. Mason & Walsh used two "Bucyrus-Erie" 43-B, 2-yard machines; two "Marion" 371, 1¾-yard; 2 "Northwest" 1-yard shovels. To aid in excavating and pouring, four large guyed derricks were erected. Later, upon completion of work at the outlet section, these derricks were shifted to the control shafts where they now are.

Excavated material was disposed of with a "Jeffrey" crusher loading a "Barber-Greene" 36-inch conveyor system extending 3000 feet, similar to the one in use at the intake operations. Digging



● *This novel device for pouring 16-ft. 8-in. vertical sections in the main control shafts was designed and fabricated on the job. Amount of concrete placed with it has been over double the previous rate.*

● *Enlarging main control shafts was ingeniously done with tractor and angledozer simply making the "rounds" and pushing loosened dirt down the pilot shafts.*

of overburden was handled without blasting except at the start and for a short time in the spring when the ground was frozen. Operations were suspended during the most severe winter weather. The two conveyors were housed for cold weather protection. Motor trucks, mainly old "Macks", were subcontracted and used to dump material to the conveyor at the outlet end.

A "Blaw-Knox" central mixing plant near the downstream portals furnished concrete for pouring operations. Sand and aggregates were furnished, as needed, by the Army Engineers.

Excavation was begun on this section in May 1934, and was largely finished by October. The principal part of the concrete pouring, and finishing of open tunnel sections, however, carried over into 1935. Disintegration of the shale prohibited final grading until just before concrete pouring.

Intake portal excavation operations began on June 1, 1935 with excavation for the footings of the steel raker beams which braced the vertical face of the cut until the blocks making up the headwall could be poured. Portals and wall are similar to those at the outlet portal but only short open-cut tunnel sections were required. Tunnel inlet portals are streamlined with bell-mouth curved entrances. For intake excavation, Mason & Walsh used some of the same machines as on the outlet. Trucks used here, were also rented. A second "Blaw-Knox" mixing plant furnished the necessary concrete.

The two portal section structures require a total of about 212,000 yards of concrete, and over 6,000 tons of steel.

Control Shafts

As pressure in the tunnels will vary considerably and the variation may come within a short period of time, some control and relief set-up is necessary. This will be provided by two control shafts, main and emergency, for each tunnel, the main shafts acting as surge chambers as well as gate housings. Located at an average distance of 2,300 feet from the intake portals, the main shafts have an excavated diameter of 60 feet, and a finished diameter of 50 feet.

The lining for these shafts is composed of two sections; the outer is corrugated steel plates braced by double-angle rings and vertical steel wales to hold the excavation; and the inner, which was not started until the shaft reached its final 240-foot depth, is a reinforced concrete shell three feet thick. Inside of this is a welded steel shell from $\frac{5}{8}$ to $1\frac{1}{4}$-inches thick, protected by an "inner inner lining" of reinforced concrete two feet thick. To assure uniform bearing against the rock, grout was poured behind the outer lining as fast as it was put down.

Emergency shafts are located 71 ft. 9 inches upstream from the main shafts, and have an excavated size of about 17 by 34 feet. Rectangular in shape, they have concrete and steel-shell linings similar to the main gate shafts.

Pilot shafts 7 feet square were put down to the tunnel level for all eight control shafts, using paving breakers and chipping hammers. No blasting was done. Mucking was done by hand into hoist buckets lifted by "Ingersoll-Rand" tugger hoists on the surface.* A portable compressor plant on the surface furnished air for paving breakers and hammers.

When the pilot shafts reached tunnel level, they were equipped with hoppers which loaded directly into regular muck trains in the pilot tunnels. Then, when enlargement was begun from the top, muck loosened by the paving breakers was pushed down the pilot shafts to the hoppers. In the large main shafts, however, a very ingenious system was developed. A "Caterpillar" tractor with angle dozer swept around

(*Continued on page 660*)

*** Editor's Note: Another system which might have been used in putting down pilot shafts involves use of modern churn drills. With these, 9- or even 12-inch holes could have been quickly sunk to the main tunnels. Muck from enlargement could have been dumped through these holes, as was done in enlarging from the 7- and 9-foot pilot shafts actually used.**

EXCAVATING ENGINEER

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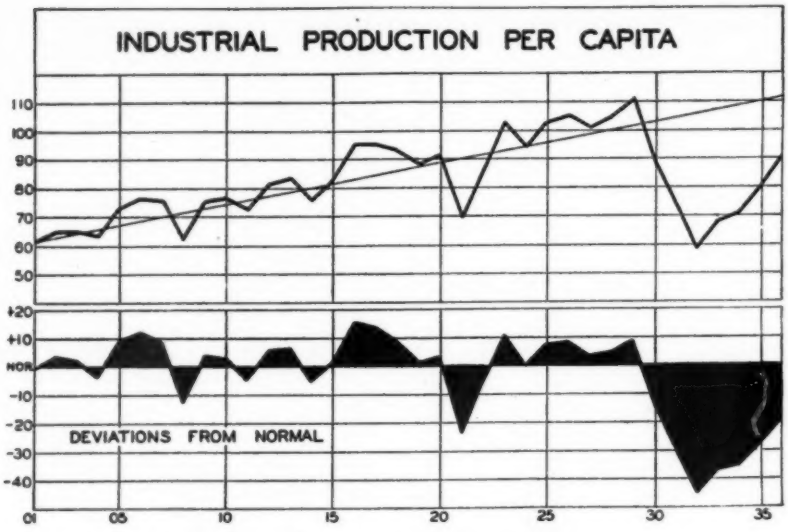
Highway Forecast

WHAT will 1937 see in the way of roadbuilding? As in past years, our January issue will present a complete and authentic forecast of highway work for next year. Highway departments of 48 states will tell you what they plan to do—how much money will be available, and approximately how that money will be spent.

From the federal government will come figures showing road work and grade crossing elimination to be done on public lands in 1937. Prominent authorities on highways will have a word to say on probable developments.

Information is now coming in to us from all over the country—not enough yet to foreshadow accurately the picture the forecast will show. Some facts, however, are already evident. One is the excellence of the provision in the new Hayden-Cartwright Act that states which have permitted no diversion of highways funds may be elligible to receive federal aid without matching.

Other regular features of our highway issue will be of interest. Operating stories and photographs of highway work, new equipment to build and maintain modern highways by modern methods—if you are interested in highways, we suggest you make it a point to get the complete information which will be in the January Excavating Engineer.

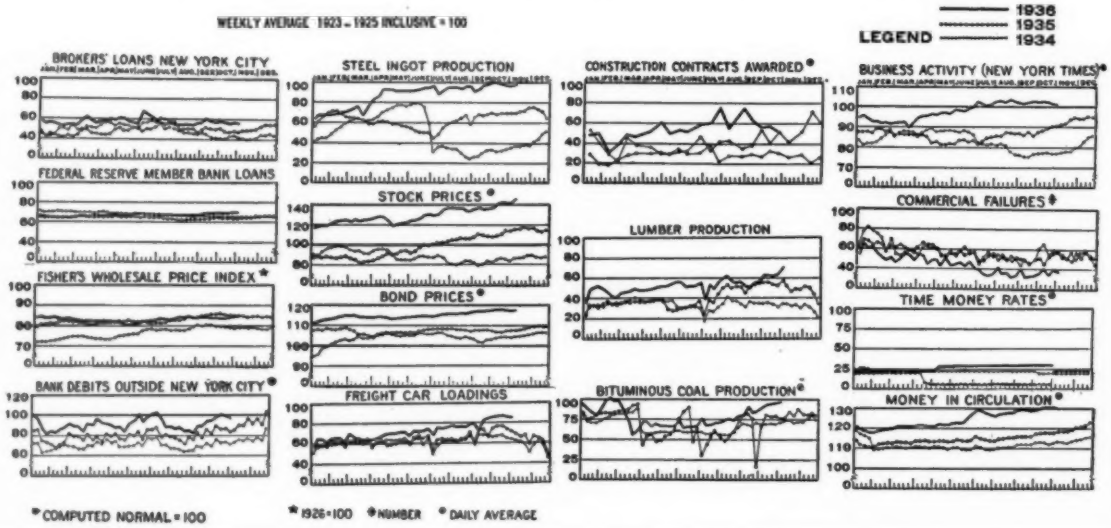


Industrial Production

THE Cleveland Trust Company has published the accompanying diagram showing per capita industrial production from 1901 into 1936. The steady upward trend shown by the straight line in the upper section has been responsible for our increasing standard of living. As per capita production of goods went up, there was naturally more for each individual. The heavy, fluctuating line shows the actual annual per capita production.

Black silhouettes in the lower part of the diagram show percentage deviations above and below the computed normal level

WEEKLY BUSINESS INDICATORS


WEEKLY AVERAGE 1923 - 1925 INCLUSIVE = 100
LEGEND 1936 1935 1934
BROKERS' LOANS NEW YORK CITY
STEEL INGOT PRODUCTION
CONSTRUCTION CONTRACTS AWARDED *
BUSINESS ACTIVITY (NEW YORK TIMES) *
FEDERAL RESERVE MEMBER BANK LOANS
STOCK PRICES *
COMMERCIAL FAILURES *
FISHER'S WHOLESALE PRICE INDEX *
LUMBER PRODUCTION
BOND PRICES *
TIME MONEY RATES *
BANK DEBITS OUTSIDE NEW YORK CITY *
FREIGHT CAR LOADINGS
BITUMINOUS COAL PRODUCTION *
MONEY IN CIRCULATION *
* COMPUTED NORMAL = 100
* 1926 = 100 * NUMBER * DAILY AVERAGE

for the years involved. This normal level is the average for 1923, 1924, and 1925. Black areas above the line represent periods of prosperity; those below, periods of depression. Particularly impressive are the depth and duration of the recent depression.

Data for 1936 are partly estimated, but not plotted on the diagram. The average level will apparently represent a recovery of about five-ninths of depression losses. At the present time, the production level is well above the average for 1936.

Construction Holds Up

RESIDENTIAL building started in October was 45 per cent greater in volume than the recorded figure for October 1935. According to F. W. Dodge Corporation, the October residential building total was $79,736,200 for the 37 eastern states as compared with $55,100,300 for October of last year and $80,670,800 for September of this year. For the ten months of 1936 ended October 31, residential building amounted to $667,767,800 as against only $394,007,800 for the corresponding ten months of last year, making a gain of 70 per cent between the two years.

The volume of non-residential building started in October in the 37 eastern states amounted to $79,071,300 as compared with only $59,180,400 for this class of work in October 1935 and $69,098,700 for September of this year. Non-residential building operations in the initial ten months of 1936 in the area east of the Rocky Mountains amounted to $814,408,400 for a gain of 70 per cent over the total of only $482,902,300 shown for the comparable period of 1935.

Heavy engineering, i.e., public works and public utilities, accounted for an additional construction volume in October of $67,032,400. Chiefly because of declines in public construction, heavy engineering jobs in October fell below their respective totals for either the previous month or October, 1935.

For all classes of construction, the October 1936 figures for the 37 eastern states totaled $225,839,900 and compares with $200,595,700 for October 1935 and $234,271,500 for September of this year. The total volume of construction of all types undertaken in the area east of the Rockies during the ten month period ended October 31 amounted to $2,267,468,100 and represents an increase of 63 per cent over the comparable figure of $1,392,293,400 for the corresponding ten months of 1935.

J. T. Skelly

JAMES T. SKELLY, vice-president and director of the Hercules Powder Company, died recently in Wilmington following an illness of six weeks. He was probably one of the best known and liked men in the explosives consuming industries — both because of his 44 years of service to those industries, and because of his inherent capacity for making friends.

Born in Nashville, Tennessee, in 1877, Mr. Skelly began his career in 1892 as office boy for the Nashville branch of the old Laflin and Rand Powder Company. He later became southern salesman, and then assistant to the general manager of sales for that company. He was put in charge of Laflin and Rand sales when that company was purchased by du Pont in 1903, later taking over direction of the du Pont Sporting Powder Division. In 1913, he became vice president in charge of sales of Hercules Powder Company, which position he filled ably until his death.

W. J. Weiman

AS we go to press, we learn of the recent tragic death of Walter J. Weiman, superintendent of the Auburn, New York, plant of the General Crushed Stone Company. Mr. Weiman was killed when he slipped between two moving freight cars on a siding. He was 49 years old.

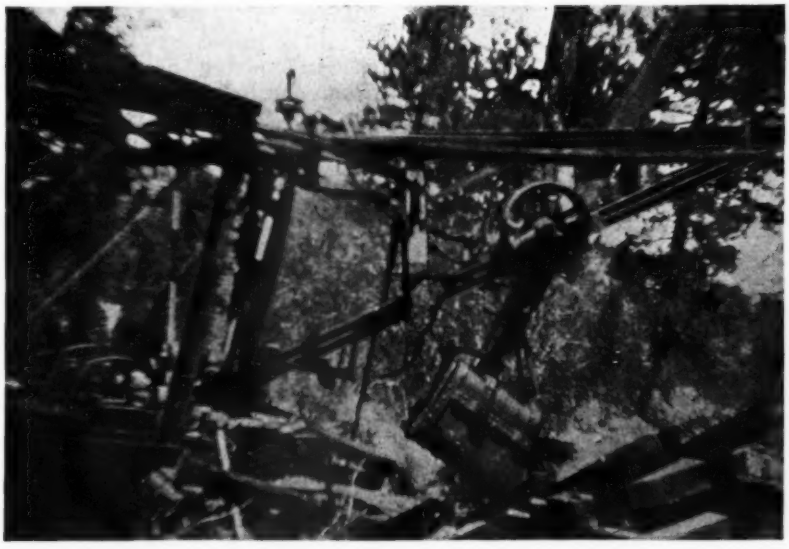
An Old Timer

From Charles R. Hine of the Crook Company in Los Angeles comes this picture of a much-looted old shovel. Enough has been left by the souvenir-hunters to indicate that it is an Otis-type machine. Mr. Hine's letter tells something of its history.

"We are attaching a print of an old English shovel of unknown make, which was shipped to Southern California on a sail boat, having been used previously on the East coast of South America. This machine was knocked down and transported to its present position from San Pedro Harbor in 1860. An English company used it for mining purposes and the machine stands at present as per photograph, having been gradually robbed over the last 75 years.

"The mounting is on rail and is self propelled. The boom is half swing type with full wheel at top of mast. It has gear crowd operated with a chain, and the boom swing is also chain operated. The boiler was locomotive type."

Can any old timer add anything to the history of this shovel?



EQUIPMENT
You Ought to Know About

Pneumatic Tired Trail Cars

AUSTIN-WESTERN Road Machinery Company of Aurora, Illinois are the manufacturers of a new, large capacity, pneumatic tired trail car for use in coal mines, capable of hauling 80,000 pounds of coal each trip from mine to tipple.

The illustration shows two of the three car units in use at the Sahara Coal Company's mine in Illinois. The three cars enable the shovel to dig and load 5,000 tons of coal per seven and one-half hour shift according to figures issued by the Sahara Company.

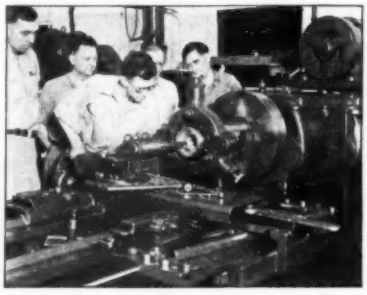
The manufacturer claims these trailers save expense and time required for track laying and roadbed construction.

To provide maximum capacity, structural weight was reduced to a minimum by employing alloy steels of high strength and durability. The car is an evolution of the hopper type coal car.

Anti-Friction Bearing Taper Attachment of Monarch

THE Monarch Machine Tool Company of Sidney, Ohio, has patents pending on an anti-friction bearing taper attachment which they assert removes much friction and lost motion and prevents back lash and wear. Twenty ball bearings located at vital points throughout the machine are said to make this possible.

In a 20 inch lathe, cuts 1⅛ inches deep, .090 inches feed, 6½ inches taper per foot have been turned in S.A.E. 1035 steel with these attachments. The tool after reversing the feed, back tracks



without removing metal indicating absence of spring and lost motion.

The ball bearings are provided with eccentric steel mounting making for ease of adjustments and are of the permanent oil seal type eliminating lubrication.

Bucket Belt

THE "U. S." bucket belt is the latest addition to the line of elevator belts manufactured by the United States Rubber Co.

Specially designed to handle light stone, coal, and similar material, this belt is made of 32-ounce duck body with a high grade cover and is to be used as an intermediary between heavy and light weight elevator belts.

Concrete Vibrator

THE Chicago Pneumatic Tool Company of 6 East 44th Street, New York City, announces a new product in their line of concrete vibrators.

The 518 designed for vibrating heavy concrete in dams, large bridge piers, abutments, footings, etc. develops a motor speed of 7,000 R.P.M., has a 35 to 40 cubic yard per hour capacity, an overall length of 4 feet, weight of 65 pounds, and an air consumption of under 80 cubic feet per minute.

In this model the motor is placed at the upper end of a short tube connecting it to the Vibrator tube, thus giving balance to the tool and making it easier to handle and more portable.

Other vibrators announced for use in thinner and lighter concrete are the model 418 having a capacity of 25 to 30 cubic yards per hour, and the 315 handling 10 to 15 cubic yards per hour.

Emergency Pipe Clamp

THE M. B. Skinner Company of South Bend, Indiana has lately perfected a series of emergency pipe clamps for use in stopping leaks in air, gas, steam, vapor, gasoline, oil, chemical, pulp, ammonia, brine, and other types of high or low pressure pipe lines.

The clamps are made of a high tensile strength metal of uniform density and hardness and are tested under a pressure of 3,000 pounds before leaving the factory.

From the illustration can be noted the raised lugs for convenience in applying the wrench. The clamp can be applied easily without shutting down the pipe line, through the convenient hinge arrangement on the side opposite the lugs.

Sizes range from ½″ to 12″.

Model E Hypressure Jenny

THE Homestead Valve Manufacturing Company of Corapolis, Pa., announces a new heavy duty cleaning unit to be known as the Model E Hypressure Jenny.

It is recommended for such cleaning jobs as the complete removal of dirt and grease accumulations from tractors — without disassembly; the cleansing of motors and underpinning of trucks; the cleaning of highway safety equipment, such as guard rails, center lines, bridge abutments, etc.; and other cleaning work in this field.

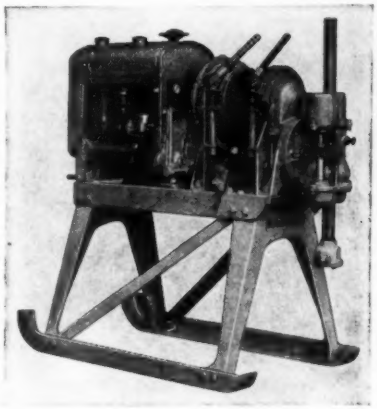
In use, Model E utilizes the combined processes for cleaning of a mixture of vapor, hot water, soap or a selected chemical, and pressure. The unit, being fully contained, carries its own fuel tank, water and solution tanks, oil burner, and vapor generator.

All that is needed to place it in operation is a water line to the water tank, and an electric connection. The whole unit is set in motion by an electric switch. Water and solution are pumped from their respective tanks and automatically mixed to a predetermined proportion enroute to the generator coils, where the solution is heated. By turning a valve on the cleaning gun, a vapor spray emerges from its nozzle with great velocity. This velocity, combined with the reaction of the heated cleaning solution, breaks up the accumulation of grease, dirt, or whatever material is being removed. The flushing action of the spray washes away the loosened accumulation.

Light Weight Core Drill and Tannergas Anti-Freeze System

THE Sullivan Machinery Company, Michigan City, Indiana, is now manufacturing No. 12 Core Drill, a light weight machine 4 feet 7 inches high and weighing little over a thousand pounds. Four compact parts—hoist, engine, swivelhead and frame—can be quickly dismantled for easy transportation, and a hydraulic or screw feed swivelhead can be set for drilling at any desired angle. Variable speeds make operation possible in either soft or hard formation. It is gasoline or electric driven.

The company also has made recent improvements in Sullivan Tannergas and Tanner Tank air line anti-freeze systems which are claimed to eliminate freezing of air lines and keep drills, hoists, brakes, tools, etc., operating in



temperatures to 70 degrees below zero. The cost of treating 100 cu. ft. of free air per minute is approximately 7c per eight hour day. By means of by-passed air, the liquid Tannergas in the Tank is agitated and throws off a dry gas which enters the line and treats the moisture in the compressed air, regardless of how far it is carried. It is non-explosive and odorless.

Harnischfeger Welding Robot

AN automatic welding machine has been developed by the Harnischfeger Corporation of Milwaukee, which, through the elimination of the hand operated electrode holder makes possible

Fig. 1.— Handling circular weld.

Fig. 2.— Handlng curved, flat weld.

the use of a higher current, welding heat, and speed of producing welding pieces.

Up to 50 standard welding rods are loaded in a magazine and then fed automatically to the welding position. As one electrode is consumed, the remaining butt is ejected and a new, full-length rod is fed into place. The renewing operation takes less than a split second. During this feeding operation, the work table stops and then starts again automatically as the new electrode makes the electric contact. The action is so swift that no break in the welded bead is evident. The arc length is automatically regulated at a constant point during the welding operation, and though the working surface be irregular, there is no apparent variation in the penetration or appearance of the bead.

This new machine can be used on flat work of any length, on circular pieces, and with pantograph attachment, on any shape. It is adaptable for use on lathes, planers, rotating tables, boring mills and with wall cranes, for welding long girders, etc. In addition to its speed and accuracy it is claimed it substantially reduces the cost of many welded pieces.

THE TOOL TO FIT THE

WHICH TYPE FITS YOUR JOB?... MISTAKES ARE COSTLY!

The "best way" to handle one dirt moving job may be far from best on another—that is why it is so important to select "the tool to fit the job." Before you make a decision that might mean the difference between success and failure—check with the man who is best suited to give you an unbiased recommendation. This man is the Allis-Chalmers representative. The fact that he has a COMPLETE line—adapted to ALL types of dirt moving work—enables him to make his recommendation honestly and without prejudice. Your A-C representative is more than a salesman—he is schooled to help you select the proper outfit for the job.

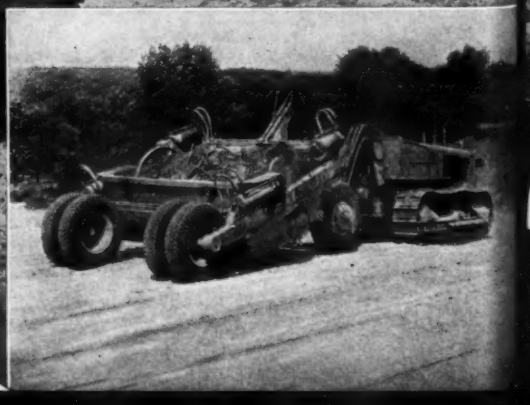
SHORT HAULS

When it's an elevating grader job, here's the winning combination—a Model "L" or "L-O" on the grader and "K's" or "K-O's" on the wagons. This is the J. A. Carlson job near Malvern, Ia.

MEDIUM HAULS

The fast-stepping easy-to-maneuver Allis - Chalmers tractor digs and carries more loads per hour on scraper jobs. These "L-O's" and Continental Scrapers are making 1/3 - mile hauls on the Genesor & Ferguson job near Exeland, Wis.

• • •



Below is a Model "L" and Gar Wood Scraper on the Osborne-Barnes job near Stamford, Conn.

BULLDOZING

Operators call the "K" and "K-O" the sweetest pair of bulldozing tractors ever to level a grade. This "WK" is on the Connell & Laub job near Marquard Mills, O.

BLADE WORK

Topped by the big Power Controlled No. 14 Grader with the exclusive Leaning Frame feature, the A-C grader line is designed "to fit the job." This all A-C outfit — Model "L-O," No. 12 Grader and No. 54 Speed Patrol — are owned by Chaves County, N. M.

LONG HAULS

Where hauls are long, and high traveling speed important, the Speed Ace hauling unit is "the tool for the job." George W. Condon has 11 Speed Aces on this job at the Casper-Alcova Dam in Wyoming.

MAINTENANCE

Whether the work is straight maintenance, oil mix, ditch work, or what not—Allis-Chalmers has a patrol to fit. Single or tandem drive. Two sizes, Gasoline or Diesel fuel oil. This is the Esty Paving Co. job, Cameron, S. C.

ALLIS-CHALMERS
TRACTOR DIVISION—MILWAUKEE, U. S. A.

Controlled Ignition **OIL TRACTORS**

Field Notes

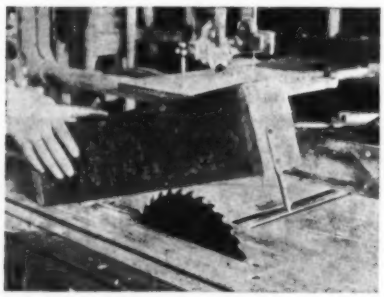
Simple Sand Test Cuts Concrete Guesswork

A SIMPLE way to determine the amount of "free" water and "absorbed" water in sand used in a concrete mixture involves the use of a small cone lightly tamped with sand. This method has been developed by the Bureau of Public Roads. Using this test it is easy to produce a condition in which the pore spaces in the sand grains are completely filled with water without any "free" water adhering to the surfaces of the particles. The moisture present when the sand is in this condition is called the "absorbed" moisture. Any excess over this amount is called "free" moisture. Bureau engineers point out that the test makes possible a much simpler and a more accurate method of making allowance in the water added to a batch of concrete for variations in "free" moisture in the sand. The test is useful both in the laboratory and in field control of concrete mixtures.

It is the so-called "free" moisture in concrete mixtures that dilutes and weakens the cement paste. Only a small part of the water used in mixing concrete is needed for complete hydration of the cement. The rest of the water lubricates the mix so that it may be placed uniformly and without difficulty. Free moisture in sand in unknown quantity upsets the scientific proportioning of concrete.

The test was developed by D. O. Woolf, associate materials engineer in the Bureau. Moist sand containing free water can be shapped into molds by light pressure. Dry sand cannot be molded. After experimenting with cones of many shapes, Mr. Woolf found that sand—lightly tamped into an inverted cone with a top diameter of 1½ inches and a bottom diameter of 3½ inches—contains free moisture if it holds its shape when the cone is removed. At the point where the sand slumps upon removal of the cone, free moisture is gone.

Many methods for determining when sand is surface dry have been suggested, but extensive study by the Bureau has shown that most of these methods are either likely to be inaccurate or so delicate that their use in routine testing is not warranted. The cone test has been adopted by the American Association of State Highway Officials.



● *Safety for workmen was one of the first considerations of James Howell, equipment superintendent for Walker Construction Company, Denver, during construction of the new Telephone Building. Cut off saws were covered, when not in use, with a small wooden box, with a metal pin at each end which fit into a hole in the saw bench and prevented its slipping.*

Repairing Wire Screens

IT IS easier to patch a hole in wire screens than most people realize, by using the following simple method:

Cut off a patch of ample size for covering the hole, and as indicated in Fig. 1, strip some of the wires from all of the edges. This leaves wires projecting out in all four directions as shown in the sketch.

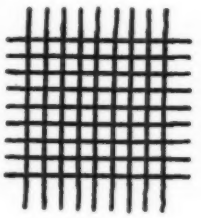


Fig. 1
Strip off wires like this.

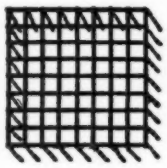


Fig. 2
Then bend like this

Then carefully bend the projecting ends perfectly square with the plane of the wire screen, as indicated in Fig. 2.

Then place the patch over the hole, pushing the projecting ends through the meshes of the screen being patched. Clinch the projecting ends on the other side of the screen.

The patch will hold surprisingly well. While the patched screen does not look as presentable as an unpatched screen, it looks much better than a screen with a hole in it. Besides, from a practical man's standpoint it is far better than a screen with a hole in it.

N. G. Near.

Emergency Wrap Keeps Snow Out of Overshoes

THE ordinary medium height overshoe is an excellent protection for the foot as far as cold and snow of moderate depth is concerned, but one is often suddenly confronted with the necessity of wading rather deep snow and drifts. The tops of such overshoes do not always fasten absolutely tight around the upper opening, allowing snow to get down in between the trousers and cloth of the shoe, where it melts due to warmth from the limb.

Take an old tire inner tube. Cut off two pieces of the thin rubber sheeting about 6″ by 16″ and some six bands from the tubing also. Wrap the rectangular strips snugly around the overshoe top and trouser leg as shown, snapping them in place with the bands. This nicely protects most of the trousers in contact with snow and prevents the snow from working and sifting down where it causes the trouble.

Frank Bentley, Jr.

Talk about Portability!

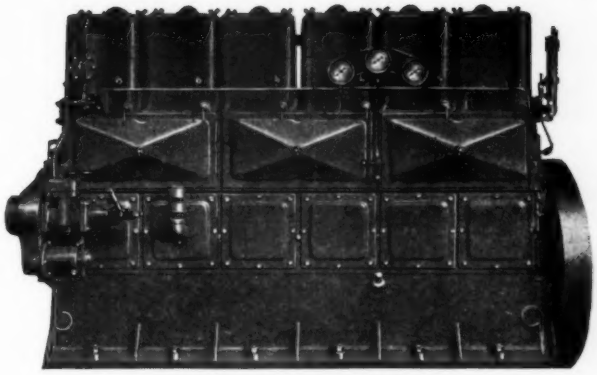
Portability of equipment is mighty important to the road builder. Profits cease and overhead continues when a rock crushing plant is not turning out aggregate. The faster a road builder can move his equipment from one location to another, the better his chances for profit.

The Dodge Construction Co., of Fallon, Nevada is setting the pace for mobility of equipment. They recently completed a highway job between Coalvale and Tonopah on Saturday night, disassembled their entire rock crushing plant, moved it miles away to another location, set it up and were ready to run the first shift Monday morning.

Their rock crusher is powered by a 200 H.P. 9"x 10½" Atlas Imperial Diesel-Generating set mounted on pneumatic tires. They have a total connected load of 165 H.P. which the Diesel-Electric unit handles with ease. From January 29, 1935 to January 29, 1936, this quickly portable unit set a new record in Nevada, placing 327,000 tons of crushed gravel.

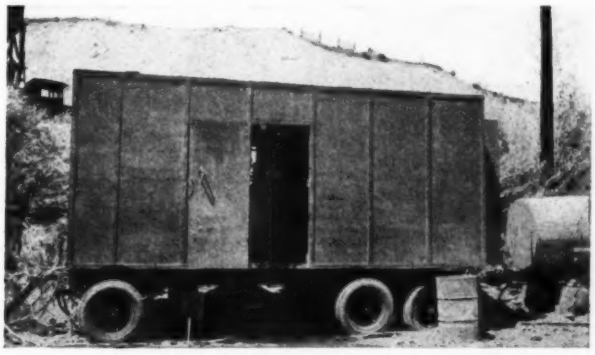
It is at present working near Reno, turning out 40 tons of gravel for hot mix and 60 yards of fines per hour. They operate 21 hours per day and every 1500 hours they shut down to change oil, at which time the spray tips are also cleaned. The engineer states that during this period they never foul or give him any trouble.

When you need power for any construction job, where reliability, economy and portability are requisite, specify the Enclosed Type, Medium Speed Atlas Diesel. It is available in 3, 4, 6, and 8 cylinder models in the following sizes: 45, 60, 80, 90, 120, 140, 150, 165, 200 and 275 H.P. Your inquiries are solicited.



Enclosed Type Atlas Imperial Diesel.

The portable rock crushing plant of Dodge Construction Company, Fallon, Nevada



The 6 wheel trailer which houses the Atlas Diesel-Electric Unit

ATLAS IMPERIAL DIESEL ENGINE CO.

Oakland, California « » Mattoon, Illinois

ATLAS IMPERIAL

For your convenience in writing to Atlas Imperial Diesel Engine Co., you will find a card bound in this issue.

Not in the Contract

Contractor: If I find I have to stay away more than one night I will send you a telegram.

Wife: Never mind. I've read it already—I found it in your coat pocket.

A prominent traveler reports that this story was related to him as a fact.

A man was on his first ocean voyage. When he filled out the British Immigration form for aliens, preliminary to receiving his landing card, listing age, nationality, profession, etc., opposite the question "Sex?" he wrote "Occasionally".

Stout Lady (to little boy). "Can you tell me if I can get through this gate to the park?"

Little Boy: "I guess so. A load of hay just went through."

Joe: Wouldn't your mother be angry if she saw you in those "terrible" shorts?

Josie: I expect she would. They're hers.

"Look at that little midget across the street!"

"Yes. His father was a Scotchman."

A police surgeon in Philadelphia says one is sober if he is able to say "Susie sat in the soup."

The one we wonder about is Susie.

Two bachelor girls were exchanging confidences just before Christmas.

One said to the other; "Sis, would a long stocking hold all you want for Christmas?"

"No," said the other, "But a pair of socks would."

"Certainly I respect your legal advice Mr. Bell, but what good is alimony on a cold night?"

"It's so hard to find an honest maid," she complained. "The last one I had, left without notice and took with her six of my best towels — those lovely ones we brought back from the Waldorf-Astoria last summer."

McCarthy: "Did you protest against the movie that represents the Irish as being disorderly?"

Murphy: "Did we? We wrecked the place."

"Ye Gods, my wife!"

She was just a quarryman's daughter—you could take everything for granite.

She: I ought to leave you and go home to mother.

He (angrily): Well, why don't you?

She: I can't. She's left father and is coming here.

Lady (over telephone): "Hello . . . is this the Game Warden?"

Man: "Yes, Ma'am."

Lady: "Do you know any suitable game for a young man four years old?"

Co-ed: I want you to tattoo a cat on my knee.

Tattooer: Nope. A giraffe or nothing.

It was a few days after a big party when two friends met.

"Well, old man, how did you get along after I left you?—get home all right?" asked one.

"No, a confounded policeman took me to the station, where I had to spend the night."

"You were lucky. I got home."

Contractor (pointing to Chinese characters on laundry ticket)—"Is that my name?"

Laundryman—"No, him b'long descliption. Means Li'l ol' man in shining suit, cross-eyed, no-teet'."

Contractor—"Er—thank you."

Angry Wife — "Now that I have an electric refrigerator, see what you can do about getting a mechanical stenographer."

Hot Spell story we liked is about the girl who went swimming in the raw in a secluded mill pond. Along came a little boy who started to tie knots in her clothes. She flopped around, found an old washtub, held it up in front of herself and marched toward the little boy saying, "You little brat, do you know what I'm thinking?"

"Sure," said the little brat, "You think that tub has a bottom in it!"

"COST LOWERING" PERFORMANCE

Drilling rock is a tough job. The machine giving low cost performance over a long period of time under any conditions is the drill which can perform its duty most satisfactorily. The L-9 is capable of doing this, because it represents the latest advance in rock drill engineering, thus GIVING PERFORMANCE. Skilled workmanship plus careful heat treatment of parts enables the L-9 to stay on the job, thus INCREASING PRODUCTION.

Inasmuch as the L-9 is the result of the ability of the producer to analyze rock drilling requirements, you will find this SULLIVAN 55-lb. drill adaptable to all your drilling conditions. FOR COMPLETE SATISFACTION use L-9s on your job.

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SHOTS *from the Firing Line*

PWA Allocations Reach $100,000,000

RECENT allotments by PWA from the $300,000,000 made available by the last Congress bring the total allocated to about $100,000,000. Recent grants total approximately $29,500,000; loans about $4,000,000 on over 350 projects with an estimated total cost of $65,500,000.

The largest allotment was a grant of $1,041,000 and a loan of $1,273,000 to the Loup River Power District, Columbus, Nebr., to provide for the distribution of power generated at two stations provided for by a previous allotment. The new money will cover the construction of 164 miles of 115,000-volt transmission line, 50 miles of 66,000-volt line convertible to the higher voltage, and six substations. These facilities permit the distribution of energy to a number of Nebraska cities and rural electrification projects. This part of the transmission system is not affected by the pending suit against PWA and the local sponsors filed by the Iowa-Nebraska Light & Power Company.

Irrigation and flood control projects in the drought area received a number of allotments, of which the largest was a grant of $515,454 and loan of $630,000 to the Montana State Water Conservation Board for the construction of a rockfill dam with a steel face on the Beaverhead River. This dam, with a crest length of 1500 feet and a maximum height of 80 feet will impound 81,000 acre-feet for irrigation purposes.

All American Canal Status

By Joseph C. Coyle

ALL sections of the All-American Canal have been placed under contract, according to John C. Page, Acting Commissioner of the Bureau of Reclamation, and a total of approximately 46,109,000 cubic yards of material has been excavated to date in digging this giant among irrigation ditches.

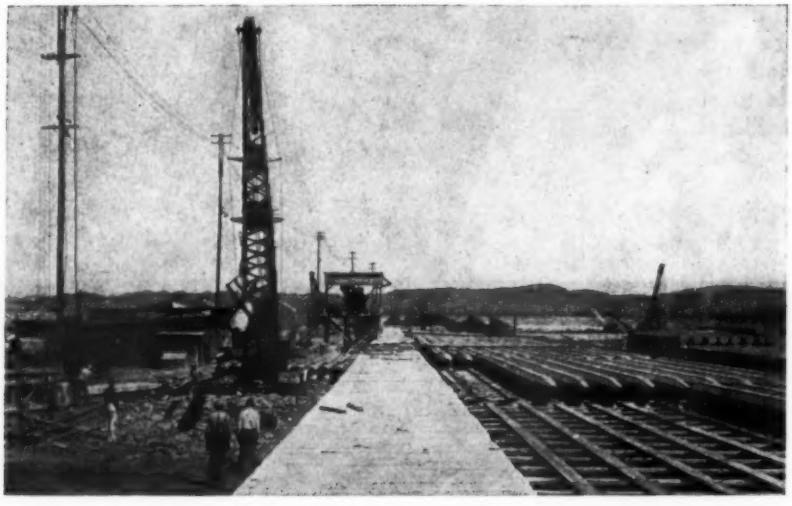
• *Lower side of Imperial Damsite as it looks from the hill in back of the California abutment.*

Good progress also is being made on construction of the Imperial Dam, the diversion works in the Colorado River at the head of the All-American Canal 15 miles north of Yuma, Arizona, and on the desilting works which will remove the silt from the waters diverted into the canal. Work is in progress under contracts of a total value of $12,155,080.90, and about 2,000 men are employed in this construction.

On the Arizona side of the Colorado River, concrete piling has been driven for the foundation of the gate structures of Imperial Dam. The excavation is being deepened near the Arizona abutment site, so that the river may be diverted when work starts later on the central section of the dam. Considerable blasting is being done by the contractor, George Condon, in portions of the excavation. Near the Arizona end of the dam Bud and Jim Stringfellow are operating a rock quarry to furnish stone for the desilting works, using a Bucyrus-Erie 1¼ yard shovel to load. Mittry Brothers have gone under ground on tunnel No. 1 on the Gila project, using a jumbo and Ingersoll-Rand drifters. Crumbly ground at the portal caused considerable trouble. Boyce-Igo have completed over a mile and a half of the main canal, near the dam, using their 6-W Bucyrus-Monighan dragline.

On the California side, three rows of sheet piling (one steel, two wood) have been driven under the dam site. Most of the concrete piling for the foundation of the gate structures has been driven.

Much of the reinforcing for the concrete slab to be poured on the upstream side of the dam is in place. Forms have been erected for the California abutment. At this writing a compacted fill is being made just below the dam, leading to the desilting works. Euclid trac-trucks, driving at high speed over a road on which no other traffic is allowed, dump pre-watered material without making a stop. This is spread with an Allis-Chalmers bulldozer, drawing a Killifer disc, sprinkled with a big tank truck and compacted with a sheepsfoot tamper. Much of the riprap work on the slopes of the desilting works has been done and work is progressing on pouring the six sludge pipe galleries, of reinforced concrete, leading from the clarifiers to the river. Many pumps, of various makes, are in



• *Swinging a special hook, this Bucyrus-Erie 50-B handles 8-ton piles for Imperial Dam.*

BUCYRUS-MONIGHAN

welcomes work in restricted areas. When the spoil bank gets so close to the edge of the excavation that any other type dragline would have difficulty in moving . . . except parallel to the excavation . . . that's where the Walker proves its mettle. The operator touches the controls . . . and the Walker steps away sharply at any angle and without maneuver. Manufactured by Bucyrus-Monighan Company, Chicago, Ill.

5-W Walker, owned by Thompson-Starrett, moving along sandy edge of excavation on Colorado River Aqueduct.

283

BUCYRUS MONIGHAN

Sold by BUCYRUS-ERIE CO.
SOUTH MILWAUKEE, WISCONSIN, U.S.A.

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use removing seepage water from dam and desilting works excavations. Near the dam a Bucyrus-Erie 50-B, with heavy steel hook hanging from the boom, is busy handling cured concrete piles, fifty feet long and weighing 8 tons each.

Frazier-Davis, of St. Louis, are well along with the pouring of 120 wash structure, using a Northwest clamshell, Rex batcher and Lake mixer. A special steel pouring body is used inside the Chevrolet dump trucks which haul from mixer to forms. A spout conducts the concrete into the buggies. The firm is also proceeding with work on Unnamed and Picacho wash structures.

George Pollock has shifted operations from the big rock cut to a canal lining job at Picacho wash. Meanwhile excavation of the cut is awaiting completion of part of the extensive fill just east of it, which the Pollock company sub-let to the Lewis Construction Company. Rock from the cut will be dumped outside the compacted fill. Dirt for the fill is pre-watered at the pit, by irrigation with pumped water, and hauled over a high speed road in Ford-Fager 16-yard dump trucks, a distance of 1½ miles.

One W. E Callahan Company 10-W, and one 6-W Bucyrus Monighan, dragline are about half way through the sand dunes. The blow sand is compartively shallow, and, after blanketing with heavier material from beneath, it gives no trouble. The other Callahan 10-W is chewing its way through rocky terrain just below the old Laguna dam, toward a point where an excavation is to be made to divert the old canal.

For the general set up at the All-American Canal, see Excavating Engineer for August, 1935.

• *Columbia Construction Company is forging steadily ahead with Bonneville Dam. Shown here, the company's Bucyrus-Monighan walking dragline is loading a big Le Tourneau "Buggie."*

Bids for Marshall Ford Dam

LOW bid for the construction of Marshall Ford Dam on the Colorado River, 23 miles northwest of Austin, Texas, was $5,781,000, submitted jointly by Brown & Root, Inc., of Austin and the McKenzie Construction Co. of San Antonio. This project is the second of three dams to be constructed on the Colorado River between Austin and Llano as a part of the Lower Colorado River Authority flood control project. The combination bid was the lowest of three submitted. All three have been forwarded to Washington for consideration before the contract is let.

The dam, which will impound 1,500,000 acre-feet of water, will be 180 feet high and 4,000 feet long.

All Bonneville Power Needed by 1945

ALL of Oregon's share of the ultimate capacity of the Bonneville power project on the Columbia River will be needed to supply the demand in Oregon before 1945, according to a forecast in the latest report of the advisory committee on power of the Oregon State Planning Board. This estimate is based on the assumption that Bonneville power will be divided equally between the states of Oregon and Washington, giving 216,000 kw. as the full capacity available for use in Oregon.

The committee's report recommends that half of the Bonneville power be reserved for domestic, public, and commercial uses, and half be made available for industry. This recommendation is based upon the fact, disclosed by the studies, that half of the present consumption of power and half of the probable consumption in 1945 is provided by domestic and commercial users.

It is further recommended that a considerable block of Bonneville power

The LINE for— the job

WHATEVER your wire rope requirements, you'll find that Bucyrus-Erie provides the best line *for the job!* On excavators, cranes, drills, etc., in either right or left lay, wire rope from Bucyrus-Erie has the strength, durability, and *suitability* to give you maximum satisfaction and service. Order from . . .

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USING a Bucyrus-Armstrong No. 8 or No. 12 Bit Dresser, you get 50 to 75% *FASTER* dressing of your bits . . . and these more accurately shaped bits will drill 30 to 50% *FASTER* than hand dressed bits. Find out how a Bucyrus-Armstrong Bit Dresser will help you make savings in your blasthole work. Write to . . .

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Why "HERCULES" [Red-Strand] Wire Rope Gives Longer Service . . . .

Quick Facts About HERCULES [RED-STRAND]

- ACID OPEN-HEARTH STEEL WIRE is used because this wire is higher in fatigue-resisting properties, thereby giving longer life on the job.
- RIGID WIRE TESTS—Every wire is rigidly tested to make sure that it meets our exacting requirements.
- METHODS OF MANUFACTURING—Our exclusive methods of manufacturing on machines of our own design insure even tension on both the wires and the strands.
- CONSTRUCTION—Made in a wide range of constructions, as no one type of wire rope is suitable for all conditions.

Of course there's a reason why "HERCULES" (Red-Strand) Wire Rope is still on the job after others have come and gone.

A service record such as this rope is making could never have been acquired if its success were left to chance. It is more logical to expect that it is the definite result of manufacturing methods learned during 79 years of rope making . . . methods which develop a well-balanced wire rope.

And therein lies the reason for the longer service which you are receiving from "HERCULES" (Red-Strand) Wire Rope, because balance is just as necessary to a wire rope as it is to a tight-rope walker . . . neither can stand up without it. In a wire rope, balance is the correct combination of strength, toughness, flexibility and durability.

So if you have a really tough job, where the wire rope must be strong to handle heavy loads . . .where it must be tough to withstand abuse . . . where it must be flexible to make sharp bends . . . where it must be durable to give long-lasting service, specify "HERCULES" (Red-Strand) Wire Rope.

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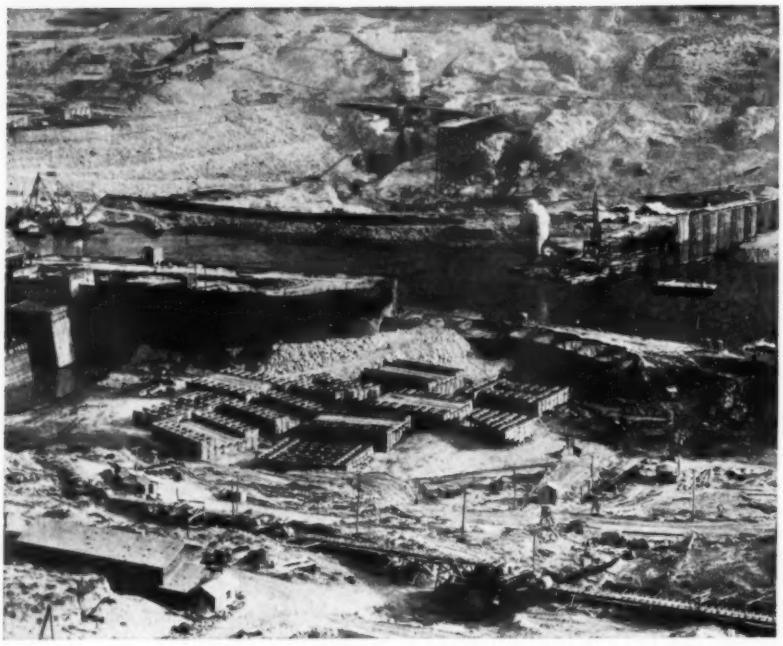

• *The Columbia is being diverted through this upstream area on the west bank at Grand Coulee. The wooden cribs shown will be floated into the river and placed in the downstream coffer dam. The belt conveyor in the foreground is being dismantled after 2 years' service.*

be made available for power-using industries at the lowest possible switchboard rate, in order to "create economic opportunity for further development and use of Oregon's large potential hydroelectric power resources."

Diversion Begins at Grand Coulee

By Grace Kirkpatrick

On November fifth at 4:10 P.M., the gates in the three 36-inch pipes in section C of the west bank cofferdam at Grand Coulee were opened by MWAK company and the diversion of the Columbia River began. This feat, which engineers describe as one of the greatest of engineering undertakings will be completed in about four months. Of course, the water let through was a mere dribble as compared with the river's volume which flows, at low water, with 5 times the volume of the Colorado at Boulder, and at high water, with ten times the volume of the Colorado. However, within twenty-four hours, the water in the new channel was about elevation 929′, or seven feet below the river level.

The diverted stream will flow behind the 120-foot high block 40, the highest sector of the concrete foundation yet poured, and it will flow over the lower sections of the foundation which has been built in a sawtooth effect to allow the waters to pass.

The rising water will soon float the 11 large wooden "cribs" that have been built behind the cofferdam. These will be floated and sunk in midchannel in the construction of the midstream cofferdams protecting construction work across the river.

The first yard of concrete on the east side portion of the Grand Coulee dam foundations was poured by the MWAK Company, November 6, in Block EBB which is filled with a network of steel reinforcing rods, similar to the control bay and power house foundation blocks on the west bank of the Columbia.

There is considerable work to be done on the lower parts of the east side pit, including the removal of large quantities of rock and earth, but there are several blocks of concrete that can be poured on the higher part of the granite abutment.

The world's largest belt conveyor, the conveyor system which "moved a mountain a mile" and has handled the huge amount of excavation on the west bank of the Grand Coulee project, has finished its service and is being dismantled.

The system was in operation just six weeks short of two years. There were four feeders in the west excavation pit, and the long snakelike structure climbed a mile and a half up the steep Columbia River gorge to deposit the material in the spoil bank in Rattlesnake Canyon. The record day's work for the conveyor, was 55,500 yards on July 5, 1935, while the grand total reached the amazing figure of 13,000,000 cubic yards.

The conveyor will be dismantled in 14-foot sections and about 80 percent of the material is expected to be salvaged.

Boca Dam Award

THE George W. Condon Company of Omaha, Nebraska, has been awarded the contract for construction of Boca Dam on the Bureau of Reclamation Truckee River Storage project, subject to execution of the repayment contract between the United States and the Truckee-Carson Irrigation District.

The successful bid amounting to $729,435 was the lowest of 18 received by the Bureau of Reclamation September 30 at its office in Reno, Nevada.

Boca Dam will be constructed on the Little Truckee River in California to conserve water for use in the Truckee Meadows area of Nevada. The dam will provide a supplemental irrigation

Long Range Digging at Lowest Cost

Sauerman Slacklines and Drag Scrapers are designed to dig and convey any distance up to 1,500 ft. at lowest cost per ton.

There is a type of Sauerman machine for under-water excavation, another for digging from a bank, another for stock-piling and reclaiming, and so on. Handling capacities range from 10 to 1,000 tons per hour.

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(taken from page 668)

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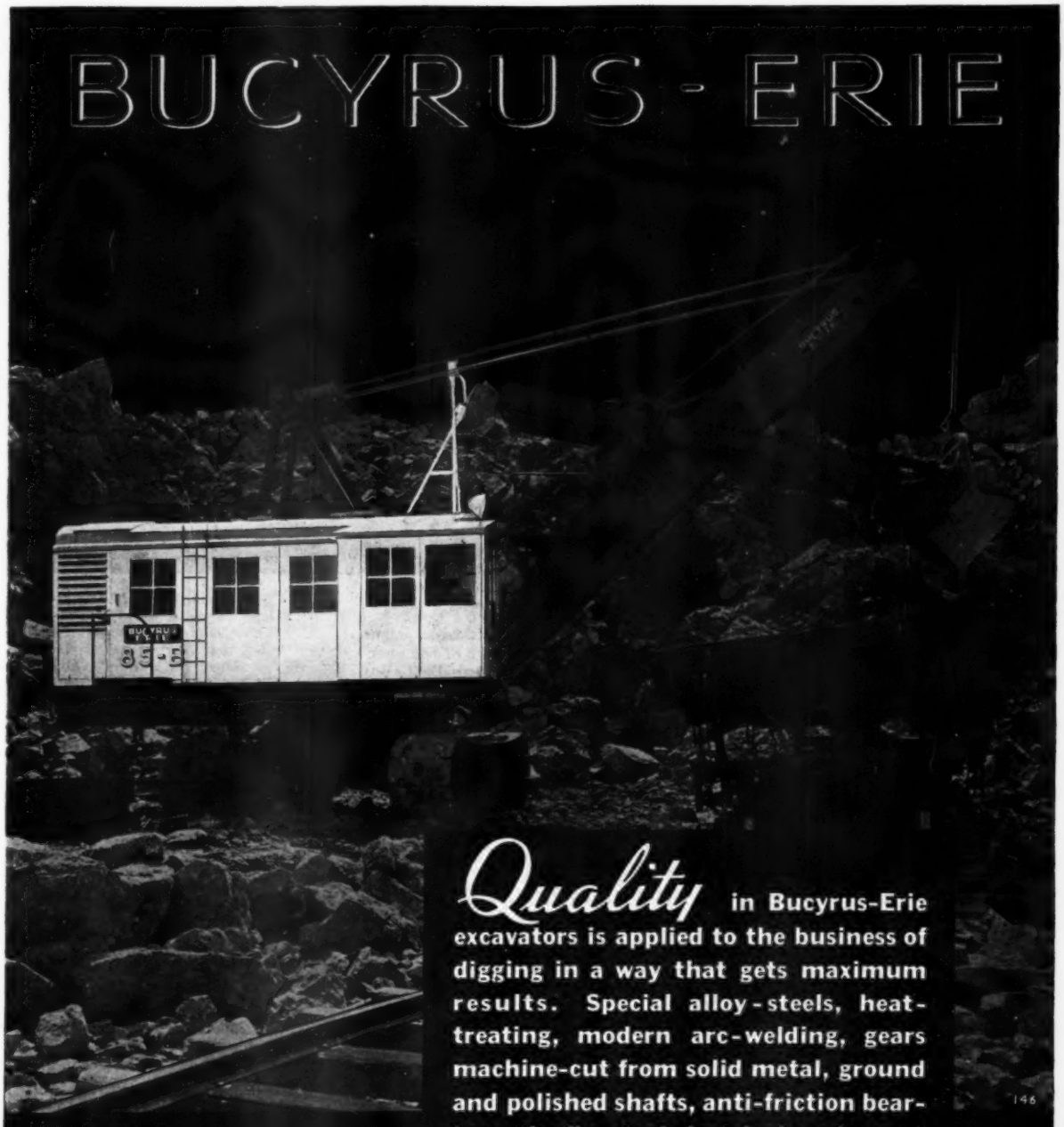

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● Illustrated: 85-B loading rock from cement quarry in New York State.

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supply for about 28,000 acres in the Reno Valley and 7,000 acres under the Truckee Canal. The Public Works Administration allotted $1,000,000 for construction of the Truckee River Storage project.

The dam will be constructed of a moistened and rolled embankment of clay, sand and gravel. It will be 1,650 feet long at the crest and about 110 feet high. A concrete-lined tunnel will be driven under the right abutment. This tunnel will be used to divert the river during construction and to house the outlet works when the dam is completed. A 3-foot layer of rock riprap will cover part of the up-stream slope. The spillway in the left abutment of the dam will be a concrete-lined open channel terminating in a concrete-lined stilling basin and will have a total length of about 555 feet. It will be controlled by two radial gates each 19 feet long and 16 feet high. A roadway will be constructed across the dam.

Work will be begun by the contractor within 30 days after he has received a notice to proceed and must be completed in 800 calendar days thereafter. There will be approximately 870,000 cubic yards of earthfill in the embankment and 115,000 cubic yards of rockfill on the downstream slope. The riprap on the upstream slope will consist of about 31,000 cubic yards of rock. The reservoir will have a capacity to the flow line of approximately 45,000 acre-feet.

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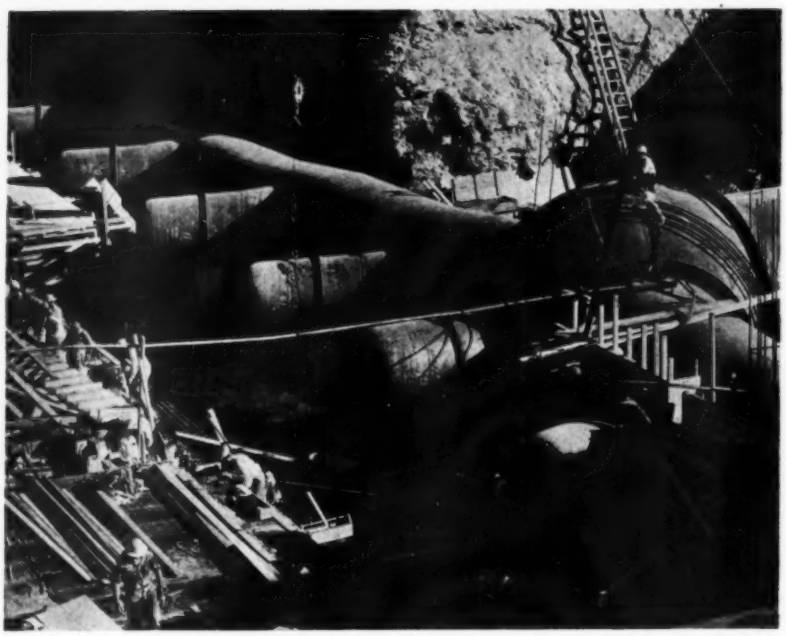

* *Installing manifold for the Gene pumping plant, Metropolitan Water District Aqueduct. Surface work on the aqueduct is going full blast as summer heat gets farther and farther in the past.*

San Francisco Bridge Opens

ON November 12, California began a four-day celebration of the opening of the San Francisco East Bay Bridge. The bridge was completed several months ahead of schedule. It is eight miles long, the greatest structure of its kind in the world, and really consists of two bridges with Yerba Buena Island in the center of San Francisco Bay as the connecting link. Towers for two of the spans rise 519 feet above the surface of the bay, and extend 235 feet below water level to bed rock. About 80,000 miles of steel wire was spun into the 28-inch cables on which the spans are hung.

Total cost of the bridge has been about $78,000,000, and it will have an annual capacity of 40,000,000 trucks and automobiles.

Progress on the Aqueduct

By Kay Campbell

BARTLETT Hayward Company of Baltimore, Md. were awarded contract for 19 large butterfly valves to be installed in pumping plants on a low bid price of $124,578. Ranging in size from 6'x6' to 5½'x5', the valves will be used in connection with the big centrifugal pumps which will lift the aqueduct water a total of 1,600 feet on its 392 mile journey from the Colorado River to the cities in the Metropolitan Water District. The butterfly leaves in these valves will weigh approximately 5,000 pounds each and will be operated by electric motors. The pumps themselves will have a capacity of 200 cubic feet of water per second.

Excavation of the tri-cities tunnels known as San Rafael No. 1 and No. 2, which run through Pasadena, Los Angeles and Glendale were holed through November 6. These tunnels, totalling 9,709 feet, were being drilled by Dixon, Bent Bros. and Johnson.

Last month, Monrovia No. 3, being drilled by West Construction Co., was holded through east of the adit. The working face was advanced from the Fish Canyon Adit, a total distance of 11,340 feet. This tunnel will have a

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lined diameter of 10 feet. To date, approximately 3,200 feet remain to be driven from the West Portal.

Pelton Water Wheel Company of San Francisco, was awarded contract for constructing six of the pump valves to be installed in the pumping plants at a low bid price of $138,994. Contract for the other valves was given to S. Morgan Smith Co. of York, Pa., who submitted a low bid of $219,075 for the nine valves.

A contract for furnishing 1000 ribs of 8-inch steel I-beam material for tunnel support in the San Jacinto tunnel was awarded the Commercial Shearing and Stamping Co. of Youngstown, Ohio at a low bid price of $29,571 for the 487 tons of steel. The pump discharge valves are a 'plug' type and will be installed in the 5 pumping plants of the main aqueduct.

Pine River Dam

THE Denver office of the Bureau of Reclamation will open bids in the Spring of 1937 for construction of Pine River Dam in Colorado. Invitations to bid will probably be issued in the near future.

Some of the estimated quantities involved are: common, open cut excavation, 1,495,000 yds.; rock excavation, open cut, 503,000 yds.; outlet tunnel excavation 16,000 yds.; common borrow pit, 1,800,000 yds.; rock, borrow pit, 93,000 yds.; stripping for dam embankment and borrow pits, 252,000 yds.; earth fill in dam, 2,775,000 yds. The work also calls for placement of about 24,000 yds. of reinforced concrete.

• From England comes this photograph of drainage ditch construction. Bottom width here is 5 feet; depth is 12 feet; slopes are 1 to 1¼. The dragline is a Ruston-Bucyrus 1½-RB, and with two men working on the slopes, it does about 60 linear feet per 12-hour day of the smooth work illustrated here.

National Paving Brick Meeting

THE 31st Annual Meeting of the National Paving Brick Association will be held at Detroit, Michigan, January 27, 28 and 29 at the Book-Cadillac Hotel. Most sessions will be open, and all who are interested in street and highway development are invited.

Papers and discussions by prominent engineers of recent developments in production and use of paving brick will feature the program.

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Diverting the Missouri

(Continued from page 641)

the pilot shaft, pushing loose material into it.

The problem presented by the blocky shale resulted in considerable difficulty in connection with the shaft foundations which had to be massive enough to support the heavy lining. Enlargement excavation of the great underground chambers necessary was accomplished by use of a heavy structural steel-frame. This framework, running from upstream side of the emergency shaft to downstream side of the main shaft, was erected in sections in cross drifts driven from the pilot tunnel. Cramped quarters made the handling of the heavy steel frame sections especially difficult. Once in place, this framework provided plenty of strength to hold the large excavation required for placement of the concrete monoliths.

Enlargement operations in the shafts were suspended a hundred feet above tunnel level until foundations were complete, as it was necessary to avoid danger from cave-ins.

Main Tunnel Enlargement

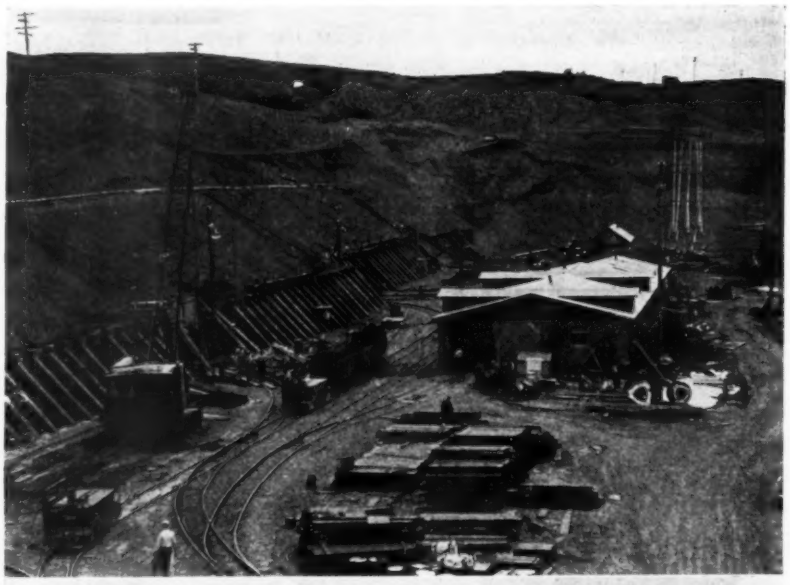
While pilot tunnels were driven from the intake end, enlargement proceeded in the opposite direction. Concreting operations had to wait for completion of downstream headblocks to permit equipment to move into the tunnels. However, drilling was carried ahead. For a short time after the beginning of pilot tunnel enlargement operations, an ingenious system of ring drilling was used. A horizontal bar, fixed in the exact centerline of the tunnels was mounted on a narrow-gage flat car. To this bar were attached pneumatic drills so arranged as to revolve in complete circles. A ring of 24 holes was drilled to a depth of 15 feet from center line in one vertical plane. These rings were spaced at about 3½-foot intervals along the pilot tunnels.

Holes were loaded and shot, one ring at a time, ahead of steel support-placing screws which, in turn, were closely followed by the concrete. Drilling operations were maintained from 700 to 1,000 feet ahead of blasting and consequently could go on continuously. However, the ring drilling from the pilot tunnels was discontinued when the top heading method of opera ion was adapted. Mucking was handled with the same machines used for the pilot tunnels.

Enlargement plant for each tunnel included a "jumbo" with five movable platforms, from which top sections of the tunnel were reached; invert forms for gravity concrete placement; a large arch form filled by twin "Pressweld" concrete guns mounted on cars.

Jumbos were used after blasting as working platforms from which rough spots on the tunnel walls were chipped down to desired dimensions. Also by means of them, the sections of ring beam supports were handled, placement of which closely followed blasting.

Ring beams were brought into



● *Top: Early operations at the intake section. Just beyond the Marion crane can be seen the entrance to one of the pilot tunnels. Bottom: Concrete plant at the outlet section. At the base of the tower is a Rex "Pumpcrete" machine.*

the tunnel in 5 sections and bolted together. Circles were centered in position and horizontal steel struts or purlins were attached between rings to maintain desired spacing. The ring beam was then fixed firmly by wood wedges driven between it and the rock. These circles then carry the weight above the tunnel until concrete is placed.

Mason & Walsh first used the full heading method of enlarging all four tunnels. Some experimentation was carried on with the top heading method, but the latter was not fully developed and the former method was finally returned to by the contractor.

After concreting, low pressure grout was forced between rock and lining. At a later date, this was followed by high pressure grout to insure filling of all pockets.

Some idea of the bustle and crowded conditions under which the work was carried on can be gained from the fact that government surveyors could find no

● *Welding played an important part in strengthening the steel bracing for the tunnel lining. Here is one welder at work in the Mason & Walsh yard.*

place to set up their equipment, and had to swing small cages from the steel beams and work from the "ceiling".

Change of Plan

The Mason & Walsh contract called for completion in April, 1937, and work was proceeding on schedule despite necessity to work out new methods to meet the new problems raised by the job. However, the speed with which the four dredges were building up the main dam in the summer of 1935 indicated that they would be ready for closure of the central section early in the summer of 1937. This meant, if original tunnel plans were adhered to, and a second contract for steel plate lining were let, that the latter contract could not be completed in time to avoid a year's delay for the dredging units.

However, if plans were changed to call for tunnels of 24-foot, 8-inch final diameter, with a reinforced concrete lining and to omit the plate lining in three of the tunnels, they could be completed by July 1, 1937. For this reason, it was decided to adopt the revised plan. The Mason & Walsh contract was terminated by mutual agreement on January 15, 1936, and the Army Engineers

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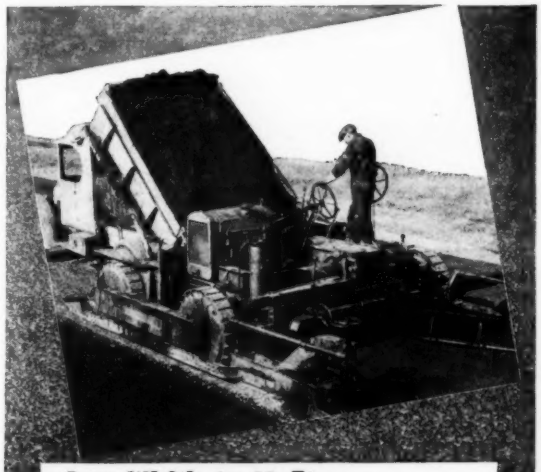

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took over the work, most of the contractors' equipment and his personnel organization.

Mason & Walsh, at the termination of the contract, had completed outlet portal structures, much of the inlet portal work, pilot tunnels, 7,431 feet of full size headings, 6,324 feet of invert concrete, 5,417 feet of sidewall and arch concrete, and enlargement of control shafts to ⅔ of the final depth.

The Army Engineers decided to handle all enlargement by top and bottom headings, which required alterations to equipment as well as to method. Jumbos were cut down to fit the smaller diameter of the revised plan. An ingenious system was devised to work top headings. This consisted of a traveling platform, moving on trolley beams hung from the ring supports. The platform was merely rolled back out of the way of drilling and blasting, eliminating necessity for removing or protecting tools and equipment left on it. Timber braces supported a working platform at the floor level of the top headings, which level coincided with the top of the pilot tunnel, and which were worked in the same manner employed by the contractor. The working platform is provided with a central opening through which a power scraper dumped muck to regular muck trains standing in the pilot tunnel. Top heading muck was thus taken out via the upper portals, relieving congestion downstream.

Two changes required by the new single lining plan were the addition of considerable steel reinforcing not originally planned, and the welding of ring beams to prevent movement under changes of stress brought about by differences in water pressure in the tunnels. Longitudinal movement is being prevented by cut-off collars poured into recesses cut into the rock deeper than the main tunnel just before pouring the latter. These collars are placed about every 800 feet.

All new work undertaken by the Army Engineers is on the 24-foot, 8-inch finished diameter basis. A 24-inch inner lining is being poured in the 28-foot, 8-inch portions prepared by the contractor to bring it down to the desired uniform finished diameter.

Novel Equipment

Despite changes in equipment and method, there was no slackening in the progress on the tunnels. New devices to speed up the work have been, and are being, put into operation constantly. One of the latest is a concrete placing machine which has nearly doubled the amount of concrete handled for the main shaft linings. The following account of it was given by the Army Engineers' public relations department.

"The new contraption, which has been dubbed 'Whirligig', 'Goldbergig' and various other names, so simplifies the work that the quantity of concrete handled per shift has been nearly doubled. Whatever name may ultimately cling to the device, the main thing about it is that it works. A steel frame, carrying a funnel-shaped hopper, is suspended to the air by cables in the center of the 60-ft. cylindrical shaft. An 'A'-shaped wood truss is in turn suspended from the bottom of the frame and funnel. The point of suspension at the apex of the truss is provided with a trunnion or roller bearing so that the whole truss can revolve easily. The 'A'-frame carries concrete chutes served by the hopper. The chutes revolve as the pouring progresses, giving an even distribution of fresh concrete around the circular walls of the shaft."

The record for enlargement to date has been the 49-foot top heading and 42-foot bottom heading advance which was made in

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Operator experienced on levee, revetment and drainage work desires work on Bucyrus-Erie steamer, any size. Seventeen years on dragline, two on clamshell and one on crane. One year each on gasoline and Diesel machines. Can do own repair work. Will go anywhere in U. S. Age 36; married. A-1 references furnished. Located in Missouri. Box 8107.

DRAGLINE OPERATOR

Operator having 10 years' experience on Diesel dragline, on levee and canal construction desires position on Diesel machine of 3 to 8-yard capacity, preferably Bucyrus-Monighan dragline. Willing to go anywhere. Can do own repair work. A-1 references. Age 30; married. At present located in Nebraska. Box 8301

STEAM SHOVEL OPERATOR

Have 25 years' experience on steam machines on all kinds of construction work. Desire position on any make, size or type steam shovel; anywhere. Can do own repair work. Best references furnished. Age 50. Married. At present located in Missouri. Write. Box 8105.

EXPERIENCED OPERATOR

Operator having 17 years' experience on all types of excavating machines desires position on drag shovel, dragline, Bucyrus-Erie or Northwest, gas or Diesel. Can handle any machine from one to 8 yards. Experience includes four years on steam machines, two years on electric, 8 years on gasoline, one year on Diesel and two years on Gas plus Air. Have two years experience on drag shovel on pipe line work. Willing to go anywhere in the U. S. A. Age 36; married. Can do own repair work and have best of references. Present location, Florida. Box 8401.

STEAM SHOVEL OPERATOR

Twenty years' experience on steam shovels on contracting and railroad work qualifies me to operate your steam engine. Age 44; married. References. Now located Southern Idaho. Box 8102.

OPERATOR

12 years' experience on steam shovels, locomotives, cranes, clamshells. Can do own repairing. Willing to go anywhere. 30 years old and single. First class references. Now located in New York. Box 8106.

SHOVEL OPERATOR

Operator—10 years' experience on shovel dragline and clamshell—on general excavation and mining—desires work on any make and type machine. Can do own repair work. Will go anywhere. Age 40; single. Best of references. Present location near Chicago. Box 8001.

SHOVEL-DRAGLINE OPERATOR

8 years' experience on shovel work, 2 years' on steam dragline, all in quarry excavators. Willing to go anywhere. Prefer working on standard Marion or Bucyrus-Erie machines. 35 years old, married. Can do own repairs. Special references. Now located southern Indiana. Box 8502.

OPERATOR

18 years dragline experience — 5 years on steam, 8 years on electric and 5 years on Diesel machines. Can do own repair work, prefer steam or electric Bucyrus machine, large or small. 51 years old, married. Can furnish excellent references. Now located Tennessee. Box 8402

● *Concrete pouring was just getting under way in the tunnel enlargements when this picture was taken. Forms can be seen being prepared to go into the tunnels. The gantry cranes shown were later moved to the control shafts. Concrete mixing plant is building at right.*

No. 3 tunnel on a single day in August, 1936. Average performance has steadily increased as well, both on excavating and lining work. No. 4 tunnel was holed through November 18, 1936, marking the completion of enlargement excavation of the four bores.

The four rectangular emergency control shafts were completed, as far as the Army Engineers' part of the job is concerned, in July, 1936. At that time, lining was completed, leaving two 7- by 12-foot clear walls for installation of Stoney type gates. The shafts were turned over to the Bartlett-Hayward Company of Baltimore who have a contract for installation of the 47-ton, 4-foot thick, 11½-foot wide gates. This contractor has rushed construction of tall concrete structures over the shafts which will house gate control equipment.

Completion of the emergency shafts released men and equipment to help speed work on the main control shafts, which will be completed about December 15, 1936.

The Chicago Bridge and Iron Works has the contract for furnishing the 25-foot sections of steel pipe which are being installed in No. 1 tunnel downstream from the shafts. These sections are placed in the tunnel three at a time, welded and riveted together and set in concrete. By November 18th, 34 sections had been set and concreted, and it is expected that this job will be completed by March 15, 1937.

In any single article, it is possible only to hit the high spots in describing the ingenuity that has been used in the successful handling of the unique, tough problems presented every day by tunnel construction at Fort Peck. The system and devices used had to be worked out on the spot, as the job was too big and too unusual for previous experience to be of more than general value. Like the other phases of this big job, the diversion tunnels at Fort Peck will stand as a monument to the ability of the men and executives who created them.

For the Army Engineers, Lt. Col. Thomas B. Larkin, District Engineer, is in general charge, Major Clark Kittrell, C. of E., Chief of Operations, with Captain A. W. Pence, C. of E., in direct charge of tunnel work. Construction Superintendent on the tunnels is Mr. O. F. Brinton.

This is the third in a series of articles describing the construction of the world's largest earth fill dam at Fort Peck. The general picture and the dredging story appeared in October and November issues.

Prisoner: "Judge, I don't know what to do."

Judge: "Why, how's that?"

Prisoner: "I swore to tell the truth, but every time I try, some lawyer objects."

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Building San Gabriel Dam No. 1

(*Continued from page 634*)

tric turbine pump of same type immediately upstream from dam lifts 1,200 gallons per minute into the tank.

The chief means of tamping is by use of dual sheepshead rollers designed particularly for the job by engineers of the Los Angeles County Flood Control District and built by Consolidated Steel Corporation of Los Angeles. Although several types of sheepshead rollers were tried, the one here described has proved the most practical on the San Gabriel job. The rollers are placed in parallel in a metal frame support. The feet are especially designed, as may be seen from the accompanying photograph, and are detachable and replaceable. The rollers are hauled by tractors and have demonstrated by actual use that they have remarkable ability to adjust themselves to surface conditions. On Zone 3 operations they compact the original 9-inch layers of freshly placed fill to 6 inches in thickness. The placed weight of Zone 3 material varies from 147 to 153 pounds per cubic foot.

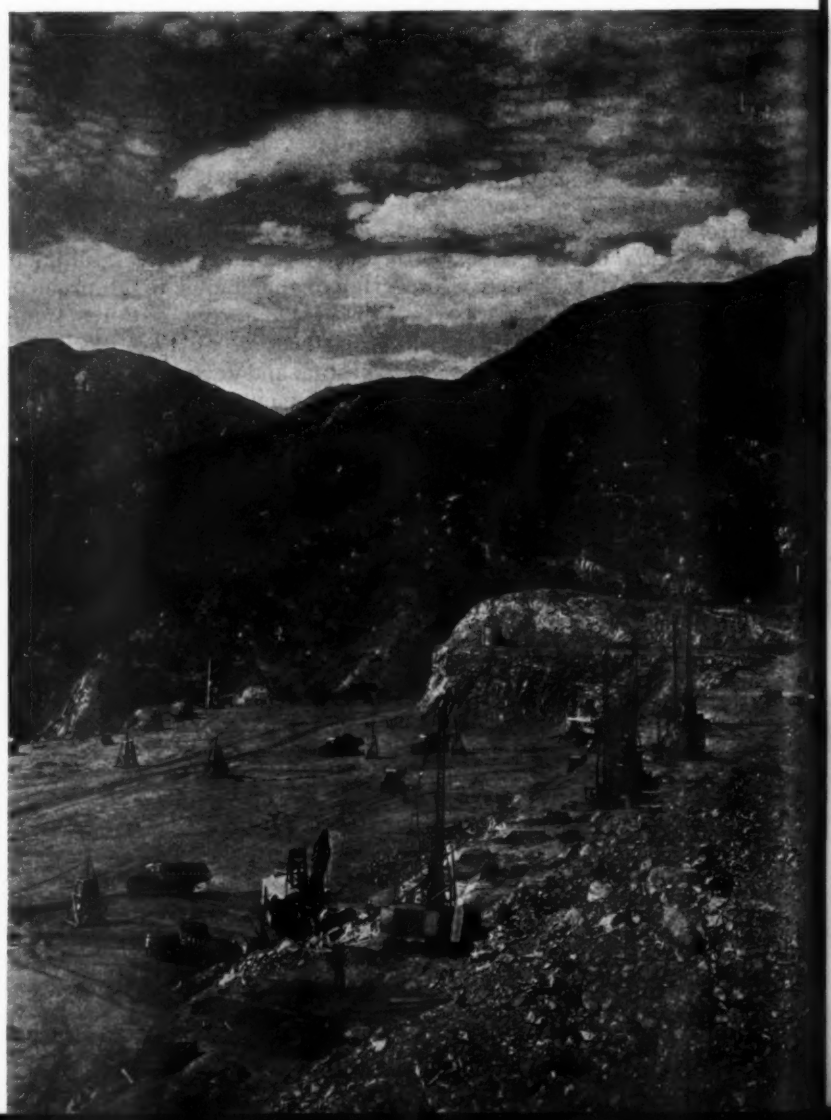
Barco hand tampers, power operated, are used for some parts of the job. These tampers are quite similar in construction to air-operated machines, with the exception that a single cylinder gasoline engine is used, the electricity for firing coming from a central portable battery system connected to each machine through flexible wires. In some less accessible portions of the fill, as for instance near the canyon walls, tamping is done with a crane and a flat-bottomed metal bucket filled with rocks or scrap metal. Hard tamped material is placed to the same density as the rest of the fill.

About 700 men are now employed on San Gabriel Dam No. 1 project. A modern, sanitary camp is provided upstream from the scene of operations. However, due to the close proximity of operations to populous San Gabriel Valley below, and even to Los Angeles only thirty odd miles away, less than half the workers actually live in camp, although the entire number with their families is about 400. A school is provided for children, and a bus takes the camp workers to and from work.

Auxiliary Equipment

There is a complete machine shop and garage on a part of the fill near the downstream toe of the dam. The garage has oiling and steam-cleaning racks, and a press for the removal of solid rubber truck tires used on some of the trucks. Oil in trucks is changed every 150 hours to insure perfect lubrication, a fact considered by engineers of the contracting firm as the key to longevity in trucks. The machine shop has lathes, presses, and drills of the latest design. The blacksmith shop contains oil-fired furnaces and drill and tool sharpening equipment.

Operations are carried on well into the night, and complete electrification of the project has been an essential. Batteries of electric lamps have been placed at strategic situations, covering the entire area with their brilliance. So unusual is the aspect of this gigantic undertaking progressing under night lights that thousands of motorists make the trip up



• *This is a comparatively early view, showing operations at one of the main quarry lower levels, before general superintendent Daly put in the ingenious chute system pictured on page 631.*

• *Part of the rock fill is being compacted by batteries of hand tampers. Those shown here are Barco gasoline rigs.*

the canyon after dark to view the spectacle. Although prospectors have found gold at times in the immediate vicinity, none at all was discovered at bed rock in the canyon river bed, engineers assert.

Change in Plan Saves Waste

Originally, work was started on the dam in February, 1933. It was stopped in the fall of 1934 to make way for a new design that would permit a more complete utilization of the fill material in the vicinity, a tremendous part of which, under the original plans and specifications, was being dumped as waste, slowing down construction and adding to the cost of the job. Of the first 450,000 cubic yards of rock placed in the dam structure, three times this yardage was discarded as waste. The new design differs in principle from the original in that it does not limit material for the fill as regards strength save in a qualitative way, and in a limited portion of the dam. The economy effected in the use of quarry material under the new design is a source of much satisfaction both to the flood control district and the West Slope Construction Company. Whereas under the old specifications it was necessary to waste nearly 3 cubic yards of material for every one usable, up to November 2, nearly 5,000,000 cu. yds. had been placed without a single yard wasted!

Personnel

The West Slope Construction Company was formed to participate in heavy construction work on the West Coast, and is composed of five companies, each of which is notable in its own right in United States and Canadian construction fields. The firms united are: Bates & Rogers Construction Company of Chicago; Foley Brothers, Inc., St. Paul; Foley Brothers, Inc., of New York City; The Lawler Corporation and J. C. Maguire, Inc., of Butte, Montana. Officers of the company are as follows: Chairman of the board is E. T. Foley of St. Paul and San Marino, California, who is also chairman of the board of Foley Brothers, Inc., of St. Paul and New York; president is W. A. Rogers, also president of Bates & Rogers Construction Company, Chicago; vice president is F. J. Anderson, president of Foley Brothers, Inc., St. Paul; treasurer, D. B. Cassell, Los Angeles; secretary, L. D. Sinclair, of St. Paul. D. A. Daley is general superintendent; E. S. Whitney is superintendent in charge; office manager and purchasing agent is D. B. Cassell; B. E. Barnhill is chief engineer; George Anderson, William Kendrick and Dave Agnew are general foremen; W. B. Arndt is quarry consultant; and E. J. Palo is master mechanic.

For the Los Angeles County Flood Control District, C. H. Howell is chief engineer. Paul Baumann is assistant chief engineer, and E. R. Stuver is resident engineer at the dam.

• *This hydraulic device, especially designed to keep the 20-yard trucks from tipping while dumping, is no longer necessary now that trucks are all being converted to the 25-yard, pneumatic-tired type.*

EXCAVATING ENGINEER Bargain Counter

★ ★ ★ THE ITEMS LISTED on these pages have been selected because they offer unusual values to the man who is looking for a bargain. Some of this equipment is surplus stock which has never been used, some is rebuilt and carries new equipment guarantee, some is just plain used. But every item is priced for quick sale. If any of this equipment fits your needs send a postcard or letter, mentioning the reference number, to *Bargain Counter, Excavating Engineer, South Milwaukee, Wisconsin.* We'll pass your inquiry along to the owner and you will receive price and complete information promptly. Act now — with advancing prices on new stock this equipment will move fast.

COMPLETE FRONT END EQUIPMENT

Shovel Equipment

½ CU. YD. DIPPER, 16' boom, 13'8" dipper handle. Shovel equipment suitable for type "A" shovel. NEW. SE-30.

¾ CU. YD. DIPPER, 12'6" dipper handle, 16' boom. Shovel equipment suitable for type "A" shovel. NEW. SE-31.

¾ CU. YD. DIPPER—25'9" BOOM—14' DIPPER HANDLE—Shovel Equipment suitable for 30-B Diesel. NEW. SE-17.

¾ CU. YD. DIPPER—20'6" BOOM, 17' DIPPER HANDLE, high lift shovel equipment suitable for 20-B steam. NEW. SE-32.

1 1 CU. YD. DIPPER—26' boom, 17' handle Shovel equipment—Will fit 30-B. SE-35.

1 1¼ CU. YD. DIPPER, 30' boom, 19' handle, high lift steam shovel equipment—Will fit 50-B. New. SE-33.

1 1¾ CU. YD. DIPPER, 22' boom, 16' handle, shovel equipment—Will fit 43-B. New. SE-34.

Skimmer Scoop

¾ CU. YD. DIPPER—20' Boom together with all necessary ropes and material to completely convert Bucyrus-Erie 1020 Shovel, Clamshell or Dragline to Skimmer Scoop Machine. NEW. Shipment 2 to 3 weeks. SS-1.

Dragline Equipment

40' CHANNEL BOOM, FAIRLEAD AND ROPES, but not including bucket. For use on Model D-2—20-B—31-B. Used. DL-3.

BRAND NEW Ropes included with each of above Complete Equipments.

Trench Digging Equipment

1 CU. YD. 42½" WIDE—Solid type Dipper—24' Boom and all auxiliary equipment. Will dig maximum depth 22'. For application to GA-2 or GA-3 Shovel. Rebuilt—New Machine Guarantee. DS-5.

BRAND NEW PAGE, two dippers each ¾ cu. yd., one 38" wide over cutters, the other 49½" wide over cutters. 17'1½" Boom and all necessary auxiliary equipment. Will fit Bucyrus-Erie 1030 or 1035. DS-7.

1-CU. YD. 42½" WIDE SOLID TYPE DIPPER—24' Boom and all auxiliary equipment—will dig maximum depth of 22'—For application to GA-2 or GA-3 Clamshell or Dragline. Rebuilt—New Machine Guarantee. DS-8.

BRAND NEW Ropes included with each of above Trench Digging Equipments.

DIPPER HANDLES

1 7'6" 1030 TUNNEL—Complete. New. H-1
1 7'10½" 20-B TUNNEL (two sticks). New. H-2.
1 9'0" 31-B TUNNEL (two sticks). New H-3.
3 9'0" 30-B TUNNEL (two sticks each). New. H-4.
1 9'6" 20-B TUNNEL (two sticks). New. H-5.
1 9'6" 31-B TUNNEL (two sticks). New. H-6.
1 12'0" 18-B—Complete. New. H-7.
1 12'6" D-2, 31-B—Complete. New. H-8.
1 12'6" D-2, 31-B—Complete. New. H-9.
1 13'0" 1020—Complete. New. H-10.
3 15'0" E-2 41-B—Complete. New. H-13.
1 16'0" TYPE "A"—Complete. New. H-16.
1 16'0"—43-B—Complete. New. H-17.
1 17'0"—TYPE "A"—Complete. New. H-18.
1 17'0"—37-B—Complete. Used. H-21.
1 19'6"—37-B—Complete. New. H-25.

BOOMS

1—15'0" 1030 CHAIN CROWD SHOVEL BOOM—Used. JA-32.
4—18' 20-B STEAM SHOVEL BOOM—New JA-2.
1—18' 31-B STEAM SHOVEL BOOM—New. JA-3.
1—20'0" 1020 ROPE CROWD SHOVEL BOOM—New. JA-23.
1—20'0" 1020 ROPE CROWD SHOVEL BOOM—New. JA-33.
1—20'0" 1030 CHAIN CROWD SHOVEL BOOM—New. JA-24.
2—20'6" 20-B STEAM SHOVEL BOOM—New. JA-4.
1—21'3" Type "B" Bar Boom—New. JA-37.
1—21'6" 37-B CHAIN CROWD SHOVEL BOOM—New. JA-26.
1—21'9" 31-B STEAM SHOVEL BOOM—New. JA-5.
2—22'0" 43-B CHAIN CROWD SHOVEL BOOM—Used. JA-27.
3—23' 20-B DIESEL, GAS OR ELECTRIC SHOVEL BOOM—New. JA-7.
1—23'6" 37-B ROPE CROWD SHOVEL BOOM—New. JA-28.
1—24'0" 43-B ROPE CROWD SHOVEL BOOM—New. JA-29.
1—24'0" GA-2 DRAG SHOVEL BOOM—New. JA-30.
1—24'0" GA-2 DRAG SHOVEL BOOM—Used. JA-34.
1—24'0 GA-3 DRAG SHOVEL BOOM—New. JA-35.
1—24' GA-2 or GA-3 SHOVEL BOOM—New. JA-8.
2—24' 43-B ROPE CROWD SHOVEL BOOM—New. JA-9.
1—25'0" 37-B ROPE CROWD SHOVEL BOOM—Used. JA-36.
1—25'9" 30-B DIESEL SHOVEL BOOM—New. JA-10.
1—26' 20-B DIESEL SHOVEL—New. JA-11.
2—26' D-2 SHOVEL BOOM—New. JA-13.
1—26' 50-B STEAM SHOVEL BOOM—New. JA-15.
3—27' 43-B ROPE CROWD SHOVEL BOOM—New. JA-16.
1—27'0" 43-B ROPE CROWD SHOVEL BOOM—New. JA-31.
1—30' 50-B ELECTRIC SHOVEL BOOM—New. JA-17.
3—30' 50-B STEAM SHOVEL BOOM—New. JA-18.
1—40' 20-B, 31-B and D-2 DRAGLINE BOOM—Used. JA-20.

Address all inquiries to Bargain Counter, Excavating Engineer, South Milwaukee, Wisconsin.

DIPPERS

Small Machines

3 ½ CU. YD.—Plate Front—Will fit 1020 Drag Shovel. New. D-45.

2 ⅝ CU. YD.—Plate Front—Will fit 20-B. New. D-12.

1 2/3 CU. YD.—Plate Front—Will fit 14-B. New. D-13.

1 ⅝ CU. YD.—Rock Type—Will fit 20-B New. D-67.

1 ⅞ CU. YD.—Ins. Tooth—Will fit 1030. New. D-47.

1 1 CU. YD.—Plate Front—Will fit 20-B. New. D-42.

1 1 CU. YD.—Rock Type—Will fit 1030 Tunnel Shovel. New. D-50.

2 1¼ CU. YD.—Ins. Tooth—Will fit 30-B, 41-B, 42-B, E-2. New. D-44.

1 1¼ CU. YD.—Rock Type—Will fit 30-B, 41-B, 42-B, E-2. Used. D-27.

1 1¼ CU. YD. — Ins. Tooth — Will fit 37-B. Used. D-52.

1 1¼ CU. YD. — Ins. Tooth — Will fit 37-B. Used. D-38.

1 1½ CU. YD.—Ins. Tooth—Will fit 42-B, 43-B. New. D-55.

1 1½ CU. YD.—Ins. Tooth—Will fit 43-B. Used. D-39.

3 1¾ CU. YD.—Ins. Tooth—Will fit 43-B. New. D-58.

1 1 CU. YD. PLATE FRONT—Will fit 30-B, 41-B, 42-B, E-2. New. D-65.

Large Machines

1 2 CU. YD.—Manganese—Will fit 43-B. New. D-62.

1 3 CU. YD.—2½" Molybdenum cast steel front, two part Van Port reversible teeth—Will fit 100-B, 68-C, 70-C. New. D-2.

1 3½ CU. YD.—2¾" nickel chrome steel front. two part Van Port reversible teeth—Will fit 88-C, 95-C, Class 80 Atlantic. New. D-3.

1 4 CU. YD.—2¾" Molybdenum cast steel front, two part reversible teeth. In good condition.—Will fit 100-C, 120-B. Used. D-4.

1 6 CU. YD.—Molybdenum steel front. Annealed cast steel back, two-part Reversible Van Port Teeth.—Will fit 200-B, 225-B and 320-B. New. D-11.

1 8 CU. YD.—Front Molydenum steel, two part Van Port Reversible teeth. Slightly used but excellent condition.—Will fit 320-B. Used. D-6.

DIPPER TRIPS

1—30-B STEAM DIPPER TRIP—New. DT-1.

1—31-B STEAM DIPPER TRIP—New. DT-2.

4—50-B STEAM DIPPER TRIPS—New DT-4.

BUCKETS

Dragline

3 2 CU. YD.—PAGE CLASS "C". 5630 lbs. New. DB-4.

1 2 CU. YD.—BECO TYPE "U". 3650 lbs. Rebuilt. DB-12.

1 2 CU. YD.—BECO TYPE "X". 5300 lbs. New. DB-23.

2 2 CU. YD.—BECO HEAVY DUTY. 5400 lbs. New. DB-24.

3 2¼ CU. YD.—BECO TYPE "U". 3850 lbs. New. DB-13.

1 2½ CU. YD.—BECO TYPE "U". 4100 lbs. New. DB-14.

1 2½ CU. YD.—BECO HEAVY DUTY. 6500 lbs. Rebuilt. DB-9.

1 2½ CU. YD.—OMAHA—STD. 5400 lbs. Rebuilt. DB-10.

1 5 CU. YD.—MONIGHAN HEAVY DUTY. 12000 lbs. New. DB-16.

1 6 CU. YD.—MONIGHAN TYPE "W". 12500 lbs. New. DB-17.

1 7 CU. YD.—MONIGHAN TYPE "W". 1370 lbs. New DB-18.

Clamshell

1 2 CU. YD. TYPE PF WILLIAMS CLAM-SHELL BUCKET without teeth and counter-weight. CSB-1.

ELECTRICAL EQUIPMENT

90 H.P. MOTOR — GENERAL ELECTRIC — 3 phase, 25 cycle, 550 volt, 1500 RPM. NEW. EE-1.

5 KVA TRANSFORMER — GENERAL ELECTRIC—2200-3810 volt primary, 440-220 volt secondary—3 phase, 60 cycle, with cast iron tank and cover, including specially fastened bushings to prevent oil leakage. NEW. EE-4.

TANKS

Water

5—260 GALLON 41⅞"x21"x6'4". No. 14 BW gauge steel plate. T-1.

2—200 GALLON 36½"x20 1/16"x6'3" high. Elliptical—¼" steel plates. T-2.

1—283 GALLON 54⅜"x17⅜"x6'4". ¼" Steel plates. T-3.

Oil

4—60 GALLON 11½"x18"x77" Elliptical Blue annealed copper alloy smooth plate. T-4.

6—25 GALLON 47¼" dia. 14" deep—12 Gauge Std. Blue annealed copper alloy steel. T-5.

1—294 GALLON 48"x21¼"x6'4". ¼" steel plates. T-6.

4—50 GALLON 60" dia. x 12" deep—No. 12 Gauge Std. blue annealed copper alloy. T-7.

Gasoline

1—44 GALLON 18" dia. 43" high—No. 14 Gauge U. S. Std. welded construction. T-8.

6—55 GALLON 30"x18½"x23½" 16 Gauge—U.S.S. Terne metal. (1 copper brazed and 5 soldered) T-9.

Air

2—5 CU FT.—16" dia. x 48" high—225 lb. working pressure A.S.M.E. Std. Tested to 340 lb. cold water test. T-10.

1—14 CU. FT.—21½" dia. x 77" high—200 lb. working pressure. Will pass inspection in Massachusetts and any Canadian Province. T-12.

2 16 CU. FT.—22⅝" dia. 77" high—200 lb. working pressure A.S.M.E. Std. T-13.

ENGINES

Designed especially for application to Excavating or similar Equipment. Can be used for stationary or semi-stationary service.

Diesel

2—140 H.P. NEW, NON-REVERSIBLE ATLAS DIESEL ENGINES—5 cylinder, 9" bore x 10½" stroke, 514 R.P.M.. 4 cycle. vertical overhead valves, dust proof. oil tight crank case and forced lubrication. Includes auxiliary air starting equipment. DE-2.

Steam

1 12½"x16" link reversing type for Railroad Shovel. ME-1.

2 4½"x5" reversible—20.8 H.P. at 400 R.P.M. 100 lb. Pressure. ME-2.

1 4¾"x5" reversible—23.2 H.P. at 400 R.P.M. 100 lb. Pressure. ME-3.

1 5"x5" reversible—25.6 H.P. at 400 R.P.M. 100 lb. Pressure. ME-4.

BOILERS

NEW

Will Make That Old Shovel Work Like New.

Can also be used for Miscellaneous Service

Vertical Type

1 46⅛"x110"—32 H.P.—155 lb. Working Pressure. Special Wood Burning Fire Box. ASME Std. Will fit any B-2 or B-3. B-9.

Locomotive Type

1 44"x17'—75 H.P. 125 lb. Working Pressure. ASME Std. Will fit Model 68-C. B-13.

AIR COMPRESSORS

1 BRAND NEW WORTHINGTON—METAL-WELD—2-cylinder 7"x6" Vertical 162 cu. ft. piston displacement, Air Compressor. Fitted with Laidlaw feather valves—Lugs on side for mounting on skids or channels—Shaft extended and equipped with semi-flexible coupling to take 2⅝" drive shaft—Force feed lubrication. Automatic control. Includes 1" High capacity centrifugal circulating pump—"V" belt driven—18"x41" Air Receiver, 100 pounds working pressure, A.S.M.E. Standard. Electric or gasoline power required approximately 30 H.P., approximately 1000 R.P.M.—Compressor Speed approximately 550 R.P.M.—Overall dimensions: Height 45"—length 37½"—width 28". AC-3.

2 11"x11"x12" STEAM DRIVEN LOCOMOTIVE TYPE, Westinghouse air compressors with fittings. NEW. AC-1.

1 11"x11"x12" STEAM DRIVEN LOCOMOTIVE TYPE, Westinghouse air compressors with fittings. Used. Make offer. AC-2.

FOR SALE

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SMALL SHOVELS
Under 2 Yards

⅜-YARD

BUCYRUS-ERIE SLIGHTLY USED—DEMONSTRATOR—10-B Gas positive rope crowd shovel. 14" Cat treads. New machine guarantee. Entire cat mounting brand new. Located Pennsylvania. Box 942-SS.

INSLEY — TYPE C — GASOLINE SHOVEL. Engine recently rebored and reconditioned. Machine generally in good operating and mechanical condition. Equipped with Buda type KTU Diesel engine. Located Arkansas. Box 814-SS.

INSLEY TYPE C combination shovel, crane and skimmer scoop. Buda 4-cylinder 4"x6½" Type KTU Engine. Field reconditioned. Excellent condition. Located Georgia. Box 834-SS.

UNIVERSAL-UNIT ¾-swing combination ⅝ cu. yd. gasoline shovel and 30-foot boom dragline, including ⅝ cu. yd. dragline bucket. Working every day. Good condition. Located Grand Haven, Michigan. Box 769-SS.

½-YARD

BAY CITY MODEL K-2 half yard gas shovel. Box 862-SS.

BROWNHOIST MODEL NO. 2 ½ cu. yd. rope crowd gasoline shovel or clamshell. Waukesha four cylinder engine in good operating condition. Bargain price. Located near Peoria, Illinois. Box 689-SS.

BUCYRUS-ERIE 16-B GAS SHOVEL. 16'-6" boom—12'-6" dipper handle—½ cu. yd. cast front inserted tooth dipper. Waukesha 6 cylinder 3¾"x4¾" gasoline engine. Excellent condition. Will demonstrate. Located western New York State. Box 930-SS

SPEEDER B-2 ½ YARD GAS SHOVEL. 16' Boom. 12' dipper handle. ½ yard plate dipper. 16" cat treads. Weight 29,200 lbs. Hercules 4 cylinder gasoline engine. Good operating condition and appearance. Few minor repairs needed. Located Albuquerque, New Mexico. Box 910-SS

THEW TYPE S electric mining crawler shovel, ½-yard bucket, 20 h.p. and 12 h.p. Otis motors. Located in Minnesota. Box 832-SS.

If You Do Not Find What You Want Listed—Write Us

Excavating Engineer

South Milwaukee, Wisconsin

⅝-YARD

P & H MODEL 300-A DIESEL SHOVEL and clamshell 18' boom—13' dipper handle—⅝ yard dipper—17" cat treads. 35' plus 5' extension clamshell boom. No bucket. Cat Diesel three cylinder D-6100 engine. Located Northern Florida. Box 863-SS.

BYERS ⅝ YARD GASOLINE SHOVEL MODEL 62CC. Has handled only about 2000 yards. Practically new. Located Virginia. Box 931-SS

P&H MODEL 204 GAS SHOVEL. 19' Shovel Boom, 16' Dipper Handle, ⅝ yard Dipper. Good mechanical condition. Located Chicago. Box 919-SS.

¾-YARD

BUCYRUS-ERIE TYPE B STEAM COMBINATION SHOVEL-CLAMSHELL AND STEAM HOE. Machine completely rebuilt 1929. Good operating condition. Located near Boston. Box 517-SS.

BUCYRUS-ERIE TYPE B STEAM SHOVEL, Cat. mounted, equipped with 19'6" boom 16' dipper stick and ¾ yard dipper including 36' clamshell boom in good working order. Located near Hudson, Pennsylvania. Price $1000.00. Box 493-SS.

BUCYRUS-ERIE TYPE B STEAM SHOVEL, Cat. mounted, 19'6" boom, 14' dipper handle, ¾ cubic yard dipper, also 36' clamshell boom and front drum and gearing. Located Kansas City, Missouri. Box 622-SS.

BUCYRUS-ERIE 20-B COMBINATION STEAM SHOVEL - CLAMSHELL - DRAGLINE. Good working condition. Caterpillar Mounted. Located near Racine, Wis. Box 701-SS.

BUCYRUS-ERIE TYPE B STANDARD ¾ YARD STEAM SHOVEL—Quarry type Dipper — Caterpillar mounted. Good operating condition. Located Georgia. Box 752-SS.

TYPE B BUCYRUS-ERIE HIGH LIFT STEAM SHOVEL 21'3" Boom, 18'4" Dipper Handle. ¾ cubic yard inserted Tooth Dipper—Power Boom Hoist — Boiler Feed Pump — Caterpillar Mounted. Located Chicago. Box 699-SS.

BUCYRUS-ERIE 1030 GAS SHOVEL. 20'6" Boom, 13'6" Dipper Handle, ⅞ yard Cast Front Inserted Tooth Dipper. Good condition. Located Minnesota. Box 920-SS.

BUCYRUS-ERIE TYPE B high lift steam shovel and 40' clamshell boom including front drum and gearing. Good working condition. Located Eastern Pennsylvania. Low price. Box 865-SS.

BUCYRUS-ERIE—TYPE B—Combination shovel and 40' boom crane. Boiler refued and the machine in fair operating condition. Located Arkansas. Box 815-SS.

BUCYRUS-ERIE TYPE B HIGH LIFT STEAM SHOVEL. Caterpillar mounted. Good operating condition. Located New Haven, Connecticut. Box 776-SS.

BUCYRUS-ERIE TYPE B high lift steam shovel. Excellent operating condition. Located Seattle, Washington. Box 943-SS.

MARION MODEL 21 ELECTRIC—M.G. SET ¾ **YARD SHOVEL.** Good condition. Located eastern Pennsylvania. Box 725-SS.

NORTHWEST MODEL 3 GASOLINE CABLE CROWD—FEATHER TOUCH CONTROL—SHOVEL. Good operating condition. Located Chicago. Box 798-SS.

NORTHWEST MODEL 3 GAS SHOVEL. 22'6" Boom, 16'4" Dipper Handle, ¾ yard Dipper. Wisconsin B-8 4-cylinder 5½"x6½" Engine. Has seen very little service. Must be seen to be appreciated. Excellent condition. Located New York. Box 921-SS.

OSGOOD MODEL 18 Steam—¾ yard shovel—Cat mounted. Just completely overhauled. Excellent condition. Located near Indianapolis, Ind. Box 522-SS.

OSGOOD AIR TUNNEL SHOVEL. 13' boom, 8' dipper handle—¾ yard dipper. Located Western New York State. Box 867-SS.

⅞-YARD

BUCYRUS-ERIE B-2 HIGH LIFT STEAM SHOVEL. 21'3" Boom—16' Dipper Handle—⅞ cu. yd. inserted tooth Dipper. Good operating condition. Located Boston, Mass. Box 853-SS.

BUCYRUS-ERIE B-2 AIR TUNNEL SHOVEL. 14'6" boom, 10'9" dipper handle—⅞ yard dipper. Located Ohio. Box 869-SS.

MARION MODEL 21 — ⅞ CUBIC YARD STEAM SHOVEL. Caterpillar Mounted. Good working condition. Located Georgia. Box 758-SS.

1-YARD

BUCYRUS-ERIE 1030 ELECTRIC TUNNEL SHOVEL. 10'7" Boom, 10'5" Dipper Handle, 1¼ yard Dipper. Equipped for power supply of 3 Phase, 60 Cycle, 440 Volt. Excellent condition. Located West Virginia. Box 923-SS.

BUCYRUS-ERIE LATE MODEL B-2 STEAM HIGH LIFT SHOVEL. 1 yard dipper—single shaft cat mounting. Good condition. Located near St. Louis. Box 518-SS.

If You Do Not Find What You Want Listed—Write Us

Excavating Engineer

South Milwaukee, Wis.

BUCYRUS-ERIE B-2 HIGH LIFT STEAM SHOVEL. 19'-9" boom—16' dipper handle—1 yard plate dipper. Fair operating condition. Price extremely reasonable. Located Long Island. Box 934-SS

BUCYRUS-ERIE GA-2 GAS-AIR SHOVEL. 22'6" boom—16' dipper handle—one yard dipper. Waukesha four cylinder 5¾"x8" engine. Overhauled approximately one year ago. Good operating condition. Located Knoxville, Tennessee. Box 870-SS.

BUCYRUS-ERIE GA-2 GAS-AIR SHOVEL. 22'6" boom—16' dipper handle—one yard dipper. Electric starter. Waukesha four cylinder 5¾"x8" gas engine. Located Louisville, Kentucky. Box 871-SS.

BUCYRUS-ERIE GA-2 COMBINATION SHOVEL AND CLAMSHELL. 24' boom. 18'-4" dipper handle—1 cu. yd. cast front inserted tooth dipper. 45' boom. Complete clamshell equipment including 1 yard Williams Fav. Clamshell bucket. Air starter. Single shaft cat. Waukesha 4 cylinder 5¾"x8" gas engine. Fair operating condition. Located Eastern Pennsylvania. Box 932-SS.

BUCYRUS-ERIE GA-2 1-yard dipper. Mounted on caterpillars. Located in Minnesota. Box 831-SS.

BUCYRUS-ERIE 30-B STEAM SHOVEL. Located St. Louis, Missouri. Box 817-SS.

BUCYRUS-ERIE GA-2 — Gas-Air Combination High Lift Shovel and 50' Boom Dragline Equipment, mounted on Single Shaft Cat. Good operating condition. Located at Fort Smith, Ark. Box 537-SS.

FOR SALE

Address all box numbers c/o Excavating Engineer at South Milwaukee, Wisconsin

BUCYRUS-ERIE MODEL B-2 High Lift Steam Shovel. Caterpillar mounted. Very good working condition. Located South Carolina. Box 644-SS.

BUCYRUS-ERIE GA-2 — Gas-air—combination high lift shovel and 45' Boom clamshell machine. Good operating condition. Located Eastern Pennsylvania. Box 945-SS.

BUCYRUS-ERIE GA-2 — Gas-Air — high lift shovel. Excellent condition. Located Wisconsin. Box 944-SS.

BUCYRUS-ERIE GA-2 COMBINATION SHOVEL AND DRAGLINE. 22'6" Shovel Boom, 16' Dipper Handle, 1 cubic yard cast front inserted tooth Dipper. 50' Dragline Boom including Fair leads but not Bucket. Air Starter. Good condition. Located Newark. Box 718-SS.

BUCYRUS-ERIE GA-2 HIGH LIFT SHOVEL. 24' Boom—18'4" Dipper Handle, 1 cubic yard Inserted Tooth Dipper. Also includes Forward Drum and Gearing and mechanism for clamshell operation including 45' boom. Also 1 cubic yard Williams clamshell bucket. Waukesha WL Engine. Good operating condition. Located Chicago. Box 702-SS.

BUCYRUS-ERIE MODEL B-2 High Lift Steam Shovel and extra front drum for clamshell but no boom or bucket. Caterpillar mounted. Good working condition. Located northern New Jersey. Price very reasonable. Box 643-SS.

LORAIN-THEW — A-1 — 1 YARD STEAM SHOVEL. 21' Boom. 15' Dipper handle. 1 yard dipper. Center drive cat. Located Toledo, Ohio. Box 912-SS

MARION MODEL 7 ONE-YARD STEAM SHOVEL, equipped with Model 450 boiler. Located Scranton, Pennsylvania. Box 873-SS.

MARION 1 CUBIC YARD STEAM SHOVEL. Bargain Price. Box 777-SS.

P & H MODEL 600 ONE YARD GAS SHOVEL. Just recently overhauled. Excellent condition. Located eastern Pennsylvania. Box 855-SS.

P&H—MODEL 600—Combination 1 yard shovel and 40' boom dragline including dragline bucket. Waukesha gasoline engine. Machine in fair operating condition. Located Georgia. Box 695-SS.

1¼-YARD

BUCYRUS-ERIE GA-2 gas-air high lift shovel. Single shaft cat. 22'-6" boom with 16' dipper handle. 1¼ cubic yard dipper. Located Chicago. Box 947-SS.

BUCYRUS-ERIE GA-2 HIGH LIFT SHOVEL. 22'-6" Boom. 14' dipper handle. 1¼ yard inserted tooth dipper. Steel cab. Electric starter. Waukesha WL-4 cylinder 6¼"x8" gas engine. Excellent condition. Located Texas. Box 913-SS

BUCYRUS-ERIE GAS-AIR TYPE GA-2 HIGH LIFT SHOVEL — 22'6" boom — 16' dipper handle—1¼ yard cast front inserted tooth dipper—single shaft caterpillar mounting—electric starter. Excellent condition. Field reconditioned. Waukesha 4-cylinder 6¼"x8" engine — New cylinder blocks and piston rings. Located near Scranton, Pennsylvania. Will demonstrate. Box 508-SS.

BUCYRUS-ERIE GA-2 GAS-AIR SHOVEL. 22'6" boom—16' dipper handle—1¼ yard dipper. Electric starter. Single shaft cat. Very good condition. Located New Hampshire. Box 880-SS.

BUCYRUS-ERIE GA-2 GAS-AIR HIGHLIFT SHOVEL, 22'6" boom—16' dipper handle 1¼ yard dipper. Single shaft cat. Wisconsin D-2 gas engine—suitable 4000' altitude. Located Texas. Box 881-SS.

BUCYRUS-ERIE GA-3 GAS-AIR HIGHLIFT SHOVEL, 22'6" boom—16' dipper handle 1¼ yard dipper. Single shaft cat. D-2 Wisconsin gas engine. Very good condition. Located New Mexico. Box 882-SS.

BUCYRUS-ERIE GA-3 GAS-AIR HIGHLIFT SHOVEL AND CLAMSHELL, 22'6" shovel boom—16' dipper handle—1¼ yard dipper—50' clamshell boom and equipment. Electric starter. Steel cab. D-2 Wisconsin six cylinder 5¼"x6½" gas engine. Box 884-SS.

BUCYRUS-ERIE 37-B Gasoline Shovel. 28' Boom 17' Dipper handle. 1¼ cubic yard dipper. Chain Crowd. Wisconsin D-3 6-cylinder 5½"x6½" Engine. Reconditioned. Excellent condition. Located Vicinity of New York. Box 840-SS.

BYERS-MASTER 1¼ YARD GAS SHOVEL. Hercules four cylinder engine. Good operating condition. Located Eastern Pennsylvania. Box 898-SS.

KOEHRING MODEL 501 1¼ yard gas shovel. Field reconditioned. Available about August 15. Located New Mexico. Box 879-SS.

LIMA MODEL 101 GAS SHOVEL—21' boom 17' dipper handle—1¼ yard dipper. Located Eastern Pennsylvania. Box 886-SS.

LINK-BELT MODEL K-42 1¼ YARD GASOLINE SHOVEL. Waukesha Model WL 6¼"x 8" 4-cylinder Engine—new blocks and pistons this year. Good working condition. Located Colorado. Box 738-SS.

LORAIN 75-A 1¼ YARD GAS SHOVEL. Reported good condition—will sell on terms. Located Memphis, Tennessee. Box 887-SS.

LORAIN MODEL 75-B GASOLINE SHOVEL—22'-6" boom—16' dipper handle—1¼ yd. all cast manganese dipper. Waukesha 4 cylinder 6¼"x8" engine. Good operating condition. Located Kentucky. Box 935-SS

MARION MODEL 450 ELECTRIC SHOVEL AND DRAGLINE. 23' Shovel boom. 16½' dipper handle with new racking. 1¼ yard dipper. 45' dragline boom and machinery included. ¾ yard drag bucket. Suitable for power supply 3 phase, 60 cycle, 2300 volts. Excellent condition throughout. Located near Chicago. Box 914-SS

MARION-MODEL 450-1¼-CUBIC YARD STEAM SHOVEL. 22' boom—15' dipper handle—1¼ yard cast front dipper—2 part reversible teeth. Excellent working condition. Favorable price. Located Virginia. Box 936-SS

MARION TYPE 32 STEAMER. Shop No. 5676, 18' boom, 15' dipper handle, 1¼-cu. yd. dipper shipped May, 1926, good operating condition. Box 451-SS.

MARION MODEL 450 1¼ DIESEL SHOVEL. Located Eastern Pennsylvania. Box 889-SS.

MARION MODEL 450 ELECTRIC SHOVEL. 1¼ yard AC-DC 3 phase, 60 cycles, 440 volts. Located Eastern Pennsylvania. Box 890-SS.

P & H MODEL 650 SHOVEL. 23' boom—16' dipper handle—1¼ yard dipper. Electric starter. Split second control. Waukesha four cylinder 6¼"x8" engine. Machine shop rebuilt. Located Milwaukee. Box 878-SS.

1½-YARD

BUCYRUS-ERIE 43-B GAS SHOVEL AND DRAGLINE. 23' shovel boom—17' dipper handle—1½ yard dipper 50' boom dragline equipment. No bucket. Electric starter. Wisconsin Model E-six cylinder 6"x7" gas engine. Excellent condition. Located Eastern Pennsylvania. Box 893-SS.

BUCYRUS-ERIE 43-B GASOLINE CHAIN CROWD SHOVEL — 23' boom — 17' dipper handle—1½ cubic yard Vanderhoef dipper and teeth—electric starter—standard single shaft cat. Operated less than six months. Excellent appearance and condition. Will be demonstrated by owner. Located vicinity New York. No. 512-SS.

BUCYRUS-ERIE E-2 DIESEL SHOVEL. 26' boom 15' dipper handle—1½ yard dipper. Good repair and operating condition. Located Boston. Box 891-SS.

OSGOOD "VICTOR" 1½ CUBIC YARD SHOVEL AND 50' BOOM CLAMSHELL MACHINE. Gasoline Power. Good operating condition. Located Minneapolis. Box 760-SS.

P&H MODEL 700 gasoline combination 1½ yard shovel and dragline. Dragline boom 50' plus 5' extension and includes 1¼ yard drag bucket. Reported good operating condition. Located Florida. Box 949-SS.

1¾-YARD

5—MARION MODEL 37, 1¾ yard steam shovels, steel cab. Good working condition. Located Minnesota. Box 825-SS.

2-YARD

BUCYRUS-ERIE 48-B DIESEL SHOVEL. 23' boom—18'-3" dipper handle—2 cu. yd. bowl door dipper. Chain crowd. Single shaft cat. Electric starter. Buda Diesel 6 cylinder 6½"x 8¾" engine. Factory rebuilt. New machine guarantee. Available December 1. Located Indiana. Box 938-SS

SMALL DRAGLINES
Under 2 Yards

¾-YARD

BUCYRUS-ERIE 10-B DIESEL DRAGLINE, 25 foot boom, long cat. Long side frames—20" treads. ⅝ yard AU drag bucket. Buda four cylinder 3⅝"x4½" Diesel engine with Excello fuel pump and fuel supply pump with filter. Kohler 800 watt light plant. Used as demonstrator. New machine guarantee. Located New York. Box 861-SD.

UNIVERSAL-UNIT ¾ swing combination 30-foot boom gasoline dragline and ⅝ cu. yd. shovel. ⅝ cu. yd. dragline bucket. Working every day. Good condition. Located Grand Haven, Michigan. Box 769-SD.

If You Do Not Find What You Want Listed—Write Us

Excavating Engineer
South Milwaukee, Wis.

¾-YARD

BUCYRUS-ERIE 20-B COMBINATION STEAM DRAGLINE - CLAMSHELL - SHOVEL. Good working condition. Caterpillar Mounted. Located near Racine, Wis. Box 701-SD.

LORAIN GAS DRAGLINE—CLAMSHELL. 40' Boom. ¾ yard capacity. Looks like new. Excellent condition. Located near Chicago. Box 911-SD

1-YARD

BUCYRUS-ERIE DA-2 DIESEL-AIR 40' BOOM DRAGLINE. No bucket. Atlas Diesel engine. Located Eastern Pennsylvania. Box 872-SD.

BUCYRUS-ERIE GA-2 COMBINATION DRAGLINE AND SHOVEL. 50' Dragline Boom including Fairlead but not Bucket. 22'6" Shovel Boom, 16' Dipper Handle, 1 cubic yard cast front inserted tooth Dipper. Air starter. Good condition. Located Newark. Box 718-SD.

LINK-BELT 1 CUBIC YARD CAPACITY 50' BOOM DRAGLINE WITHOUT BUCKET. Gasoline power. Reported good operating condition. Located near Chicago. Box 724-SD.

FOR SALE

Address all box numbers c/o Excavating Engineer at South Milwaukee, Wisconsin

SMALL DRAGLINES
Under 2 Yards
continued

P&H—MODEL 600—Combination 40' boom dragline and 1 yard shovel including dragline bucket. Waukesha gasoline engine. Machine in fair operating condition. Located Georgia. Box 695-SD.

1¼-YARD

BUCYRUS-ERIE 34-B DIESEL DRAGLINE. 45' boom—Atlas six cylinder 6¼"x8" engine. Standard single shaft cat. No bucket. Used approximately one year. Field reconditioned. Located San Francisco. Now available. Box 877-SD.

LORAIN 75 GAS—50' BOOM DRAGLINE. No bucket. Waukesha four cylinder 6¾"x8" engine. Reported excellent condition. Located Eastern Pennsylvania. Box 888-SD.

MARION MODEL 450 ELECTRIC DRAGLINE AND SHOVEL 23' Shovel boom, 16½' dipper handle with new racking. 1¼ yard dipper. 45' dragline boom and machinery included. ¾ yard drag bucket. Suitable for power supply 3 phase, 60 cycle, 2300 volts. Excellent condition throughout. Located near Chicago. Box 914-SD

1½-YARD

OSGOOD-VICTOR No. 4 Gasoline 50' boom dragline and 1½ yard RC Page drag bucket. Wisconsin 6 cylinder 5¾"x6½" engine recently overhauled. Machine generally in very good condition. Located Eastern Pennsylvania. Box 948-SD.

P&H MODEL 700 gasoline combination 1½ yard dragline and shovel. Dragline boom 50' plus 5' extension and includes 1¼ yard drag bucket. Reported good operating condition. Located Florida. Box 949-SD.

TWO P&H 700 DRAGLINES. 1½ cu. yd. buckets on 50' booms. Gas and Diesel. Located Lower Rio Grande Valley, Texas. Box 618-SD.

SMALL CLAMSHELLS AND CRANES
Under 2 Yards

⅜-YARD

BAY CITY "PUP" CLAMSHELL MACHINE. Good operating condition. Box 514-SCC.

½-YARD

BYERS BEARCAT CLAMSHELL—Crane—30' boom. Will handle ½ cubic yard bucket. Located near Grand Rapids, Mich. Box 648-SCC.

ORTON 24' BOOM—½ CUBIC YARD CLAMSHELL MACHINE. ½ cubic yard Owen Clamshell Bucket. Hercules 55 HP. Gasoline Engine. Factory rebuilt 1932. Good operating condition. Located Tennessee. Box 709-SCC.

¾-YARD

BUCYRUS-ERIE 20-B COMBINATION STEAM CLAMSHELL—DRAGLINE—SHOVEL. Good working condition. Caterpillar Mounted. Located near Racine, Wis. Box 701-SCC.

LORAIN GAS CLAMSHELL—DRAGLINE. 40' Boom. ¾ yard capacity. Looks like new. Excellent condition. Located near Chicago. Box 911-SCC

O & S MODEL "T" ¾ yard clamshell machine. 40' boom. Good working condition. Powered with Climax 5½"x7" gasoline engine. Located near St. Louis. Good working condition. Box 651-SCC.

1-YARD

AMERICAN-GOPHER. 1 yard clamshell machine. Gasoline powered. No bucket. Located Michigan, near Grand Rapids. Box 946-SCC.

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BUCYRUS-ERIE GA-2 COMBINATION SHOVEL AND CLAMSHELL. 24' boom, 18'4" dipper handle—1 cu. yd. cast front inserted tooth dipper. 45' boom. Complete clamshell equipment including 1 yard Williams Fav. Clamshell bucket. Air starter. Single shaft cat. Waukesha 4 cylinder 5¾"x8" gas engine. Fair operating condition. Located Eastern Pennsylvania. Box 932-SCC.

If You Do Not Find What You Want Listed—Write Us

Excavating Engineer
South Milwaukee, Wis.

1¼-YARD

NORTHWEST MODEL 105 Gasoline—40' boom clamshell. Good operating condition. Located Iowa. Box 516-SCC.

1½-YARD

OSGOOD "VICTOR" 50' BOOM CLAMSHELL MACHINE AND 1½ CUBIC YARD SHOVEL. Gasoline Power. Good operating condition. Located Minneapolis. Box 760-SCC.

LARGE SHOVELS AND DRAGLINES
2 Yards and Over

STRIPPING SHOVELS
5—ELECTRIC SHOVELS—Marion No. 125, No. 300, No. 350, Bucyrus 50-B. Diesel. One Clark 30-yd. steel and 20-yd. Western Dump cars. One 35-ton Standard Gauge Plymouth Locomotive.
Charles E. Murphy Bloomington, Indiana

P&H 900 DIESEL DRAGLINE, 100 ft. aluminum boom, 4 cu. yd. Page Automatic medium weight bucket. New Fairbanks-Morse latest design engine — roller bearing wrist pins. Standard length caterpillar type mounting. Treads 42 inches wide. New 1932. Can be demonstrated on three days' notice. Excellent condition. Located near Omaha. Box 941-LSD.

1½-W MONIGHAN WALKER. Diesel power. 2 yard capacity. 60-foot boom. Good condition. Reasonably priced. Located Kansas. Box 742-LSD.

BUCYRUS-ERIE 50-B STEAM COMBINATION SHOVEL-DRAGLINE. 25' boom, 17' dipper handle, 2 cubic yard dipper. 60' boom dragline equipment including 2 cubic yard Page Class M bucket and steam operated lighting plant. Machine can be placed in operation quickly with installation few small parts. Very attractive price. Located Alabama. Box 842-LSD.

2-W MONIGHAN WALKER, 3½ yard capacity. 70-foot boom. Good condition. Reasonably priced. Located Kansas. Box 743-LSD.

CLASS 230 STEAM DRAGLINE. 175-foot steel and aluminum boom. 6-yard RED ARCH bucket. Ready to work. Located near New Roads, Louisiana. Box 751-LSD.

TYPE 175-B ELECTRIC, No. 794 equipped with 87' shovel boom, 45' dipper handle, 3½-yd. bucket, and dragline equipment including 125' boom, and 3½-yd. bucket. This machine was recently reconditioned and is in good operating condition. Present location, Connecticut. Box 263-LSD.

BUCYRUS-ERIE 50-B, 1¾ yard steam shovel, steel cab, may be inspected. Located Minnesota. Box 827-LSD.

FOR SALE OR RENT

320-B BUCYRUS STEAM DRAGLINE, truck mounted, 165' boom. 6 and 8 cu. yd. Bucyrus-Erie dragline buckets. Also shovel attachment consisting of 100' boom, 52' dipper handles, two 8 cu. yd. dippers (one new). Machine located on Canadian side Detroit River near Detroit; shovel attachment located in Vermont. Both duty paid into Canada. Can work or be shipped anywhere in U. S. or Canada. $10,000 worth spare parts available. Priced right. Box 926-LSD.

PRICE VERY ATTRACTIVE

BUCYRUS-ERIE 50-B STEAM COMBINATION SHOVEL AND DRAGLINE, shop number 10557. 26' boom, 17' dipper handle, 2 yd. dipper. 50' boom dragline equipment, 1¾ yd. Page bucket. 1 KW 32 volt Moon electric light plant. 54"x9'7" standard coal burning locomotive-type boiler. Also 2 steel under-frame flat cars on which machine is now loaded. New 1929. Moved only 250,000 yards of material. Excellent condition. Price very attractive. Located Kansas City, Mo. Deal direct with owner. Box 900-LSD

100-B STEAM SHOVEL, 3 yd. dipper, located Eastern Canada. Immediately available. Used—good condition. Box 669-LSD.

100-C BUCYRUS STEAM SHOVEL on trucks. 3½-yard dipper. New 1914. Willing to sell very cheap. Located near Allentown, Pa. Box 807-LSD.

BUCYRUS-ERIE 50-B DRAGLINE. 70'boom, Atlas Imperial Diesel Engine. 2½-yard Page bucket. Early sale desired. Located near Utica. Box 940-LSD

50-B STEAM SHOVEL, Number 3946; equipped with 1½-cubic-yard dipper, 26-foot boom, also 1½-cubic-yard dragline bucket with 50-foot boom caterpillar mounted, equipped for burning oil, located at Texarkana, Ark. Price $3,000. Box 112-LSD.

PAGE DRAGLINE, track mounted, 90-foot boom, 3½-yard Page RC bucket with new 150 h.p. Venn-Severin Diesel engine. Thoroughly overhauled and rebuilt in 1935. Now working in Indiana. Box 768-LSD.

FOR SALE OR RENT

TWO CLASS 14 STEAM DRAGLINES, 70-foot booms and 2-yd. buckets. Caterpillar mounted. Equipped for burning gas or oil. Located in southwest. Price at approximately $4,000 each. Box 821-LSD.

CLASS 320 STEAM DRAGLINE. 144-foot boom. 8-yard bucket. Located on Illinois River. A good buy. Box 750-LSD.

CLASS 14 DIESEL-ELECTRIC DRAGLINE, 70-foot boom. 2-yard bucket. Immediately available. Located near St. Louis. Box 749-LSD.

70-C BUCYRUS STEAM SHOVEL on Cats. Complete. In operating condition. Shop number 1712. Also one extra three-yard Manganese dipper and sticks. Chicago territory. Box 347-LSD.

MARION 480 2-YARD STEAM SHOVEL, good working condition. Substantial saving. Located in Minnesota. Box 826-LSD.

BUCYRUS-MONIGHAN 3-W walking dragline. 85' boom, 2½-yard bucket. Located Stovall, Miss. Box 843-LSD.

BUCYRUS-ERIE, 70-C, 2½-yard steam shovel, railroad type. Located in Minnesota. Box 829-LSD.

FOR SALE

Address all box numbers c/o Excavating Engineer at South Milwaukee, Wisconsin

P&H MODEL 900, 3½ yard Diesel Shovel. 35-foot boom, 200 h.p. Fairbanks-Morse engine. Mounted on caterpillars. Box 828-LSD.

CLASS 14 DIESEL ELECTRIC DRAGLINE for sale. 70' boom. Can be seen working during next 30 days. Good price. Southern location. Box 846-LSD.

BUCYRUS-MONIGHAN 4-W Walking dragline, 80' boom 5½-yard Page bucket, 30' boom insert and 4-yard bucket. Located Tennessee. Box 844-LSD.

FOR SALE OR RENT

CLASS 24 BUCYRUS STEAM DRAGLINE. 125' boom. Skid and roller mounted. Spare parts. Located on Detroit River near Detroit. On Canadian side, duty paid into Canada, but can work or be shipped anywhere in U. S. or Canada. Priced to sell. Box 927-LSD.

ANY FAIR OFFER ACCEPTED

Class 24 steam dragline. 100 foot boom, 5 cubic yard bucket. Skid and roller mounted. Rebuilt 1927 at a cost of $15,000. New locomotive boiler installed 1928. Will accept any fair offer. Located near Fort Worth, Texas. Box 823-LSD.

3—MARION 92-M, 4-YARD RAILROAD TYPE steam shovels located near Hibbing, Minnesota. Box 830-LSD.

BUCYRUS-ERIE 50-B Steam shovel, located Montana. Attractive price. Box 845-LSD.

68-C BUCYRUS ELECTRICALLY OPERATED SHOVEL, equipped with 2½-yard manganese front dipper, 3 phase, 60-cycle, 440-volt motors, transformers, cable, reel and approximately 1400 feet of cable all in excellent condition. Reasonable price.
Address Box 268-LSD.

MONIGHAN DRAGLINE MODEL T, 2-cubic-yard 60-foot boom located near Wichita, Kansas. About seven years old. Has recently been thoroughly overhauled. Box 180-LSD.

BUCYRUS-MONIGHAN MODEL 5-W, 100-foot boom, Fairbanks-Morse 250 h.p. Diesel Engine, 5-yard Esco bucket. Excellent condition. Located near Utica. Box 939-LSD

MONIGHAN STEAM DRAGLINE, two cubic yards capacity. 60' boom. Horizontal locomotive-type boiler. 2½-yard Page bucket. In good operating condition; overhauled in 1931 and not used. Located Iowa. Box 770-LSD.

CLASS 14 STEAM DRAGLINE, 60' boom. 2 cubic yard Page bucket. Locomotive-type boiler. Thoroughly overhauled and ready for service. Located Iowa. Box 771-LSD.

TWO 3-W MONIGHAN WALKERS. 3½ yards. 70- and 77-foot booms. Good condition. Reasonably priced. Located Louisiana. Box 745-LSD.

BUCYRUS 320-B STEAM STRIPPING SHOVEL, shop number 4205, new in 1925, used less than four years. Located at Toronto, Ohio. Box 74-LSD.

2-W MONIGHAN WALKER. 2½ yard capacity. 70-foot boom. Good condition. Priced reasonably. Located Louisiana. Box 744-LSD.

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LOCOMOTIVE

BALDWIN, 17x24 straight drive standard gauge 45 ton locomotive. 54 inch boiler. Shop number 33962. Has passed State Boiler Inspection yearly. Boiler will stand cold water test of 240 lbs. At present in actual service in Minnesota mine. Box 152-ME.

LOCOMOTIVE CRANES

LOCOMOTIVE CRANE

LINK-BELT, new flues recently, 40' boom, 8 wheel, 20 ton cap, orange peel bucket. in Okla., will deliver Chicago or Denver. $3,850.00. C. E. Wainright, P. O. Box 1586, Tulsa, Oklahoma.

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WANTED—CRANE BOOM

FOR SPEEDER SHOVEL, Model B4, Shop number about 1140, wanted one 30 to 40-foot crane boom. Write full particulars and give approx. weight and shipping charges Springfield, Mass. Box 950-ME.

WANTED—SHOVEL ATTACHMENT

WANTED AT ONCE a ⅝ yd. Byers "Bear Cat" Shovel attachment, old style, live boom type. Must be bargain for cash. State age, condition, weight and approx. shipping cost to Shreveport, La. Box 951-ME.

WANTED

PORTABLE POWER WINCH OR DRUM HOIST, 3 ph. 60 cycle, 440 volt motor or gasoline engine power. Should be capable of lifting 10 tons. Vicinity New York. Write full particulars. Box 952-ME.

WANTED AT ONCE

GOOD USED AIR COMPRESSOR. Must furnish air at 100 pounds of pressure for one or two drills. Prefer portable gas unit. Must be priced to sell. Give all particulars. Joe Richardson. Oakland City, Indiana.

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The following equipment is located in Minnesota. Full details on request.

5—Boilers.
12—36" gauge Koppel double truck flat cars.
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4—Swing & Boom engines for Marion 31 & 36 shovels.
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1—Complete Ainley Placer gold machine.
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Offered for sale by Southern contractor. Priced to sell.
7—Railroad Type Steam Shovels 2½ to 5 yd.
3—Full Revolving Shovels, ¾ yd.
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2—Locomotives 26 Ton, American Saddle Tank.
32—12-yd. Western Heavy Duty Dump Cars.
1—Flat Car.
3—Camp Cars.
2—1-bag Gasoline Concrete Mixers.
Pumps, Boilers, Jacks and Other Tools.
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COMPLETE EQUIPMENT for 2 strip mines, contractors or quarry operations, No. 300 and No. 36 Marion steam shovels, well drills, locomotives, 4 to 15 yd. cars, crushers, picking tables, loading booms, cable and button retarders, compressors, motors, transformers, flood and search lights, camp equipment and new repair parts for above. Box 195-ME.

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ONE (1) PARSONS No. 40 TRENCHING MACHINE, 18' ladder with buckets for from 18 to 42" trench. In good mechanical condition. Located in St. Louis, Missouri. Price $5000.00 F.O.B. cars.
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ONE COMPLETE 52-B DIESEL SHOVEL FRONT END. Consists of boom, dipper handle and 2¼ cu. yd. dipper.
TWO COMPLETE 52-B ELECTRIC SHOVEL FRONT ENDS. Consist of Booms, dipper handles and 2¼ cu. yd. dippers. Motors on booms are 3-phase, 60 cycle, 2300 volt current.
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1½ cu. yd. shovel front end—new dipper—for Marion 32 steamer. Priced right. Located near Chicago. Box 857-ME.

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1 Six Yard Dipper

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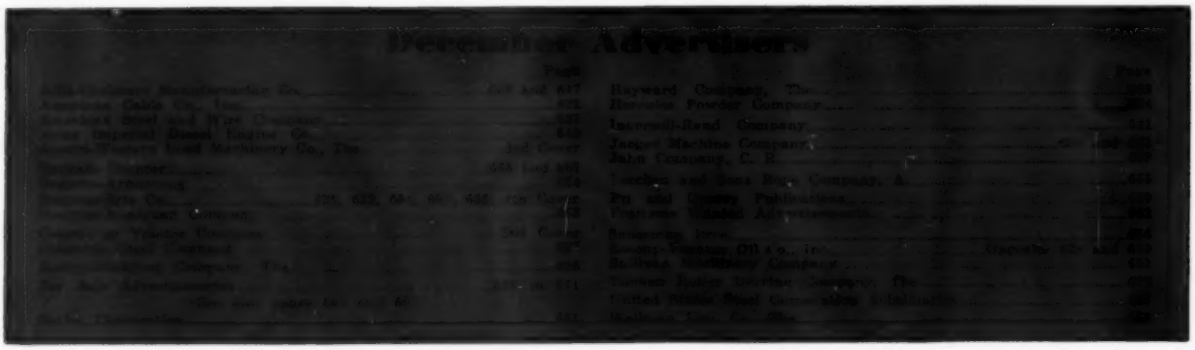

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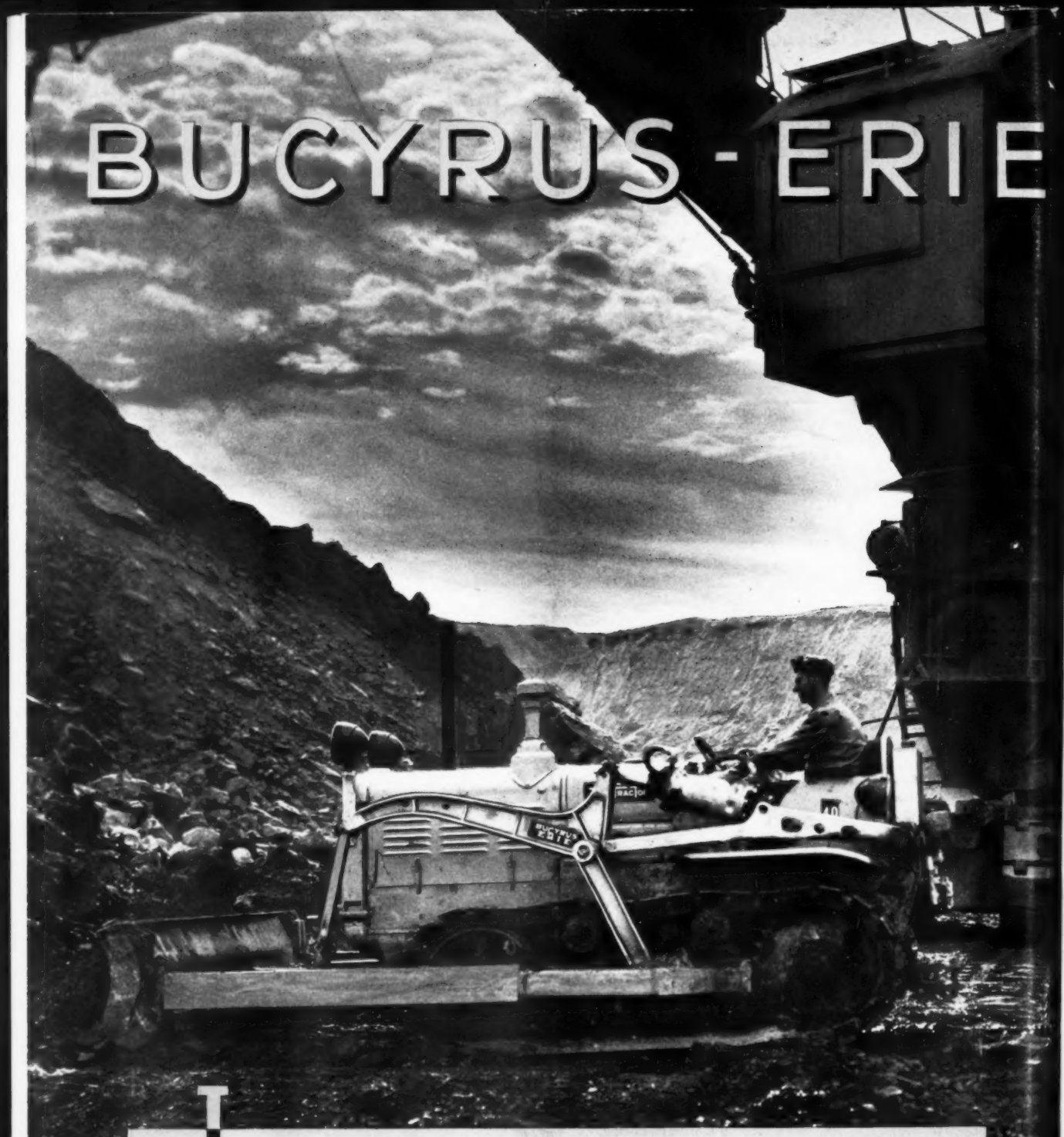

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